RECOMMENDATIONS FOR ACTION ON POLLUTION AND EDUCATION IN TORONTO:

A REPORT

Prepared for

The Pollution and Education Review Group of
The Board of Education for the City of Toronto
155 College St., Toronto, Ontario M5T 1P6.

by

Bruce M. Small and Associates Limited
R.R. #1, Goodwood, Ontario L0C 1A0.

(Consultation Paper, May 1985)

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THE POLLUTION AND EDUCATION REVIEW GROUP

The Pollution and Education Review Group was formed by the Board of Education for the City of Toronto in September 1984 to advise the Board on present scientific and practical knowledge concerning the effects of polluted school environments, both indoor and outdoor, on the health, well-being and educational performance of students and staff, and to recommend action programs to address any problems discovered.

The membership of the Group at the time of writing this report is as follows:

Chairman: Ron W. Halford,
Associate Director of
Education - Operations

Staff Member: Otto Langmark
Planner-Demographer

Trustees: Nola Crewe
Betty Disero
Denise Gosnell
Doug Little
Fiona Nelson
Bob Orr
Tony Silipo
Beare Weatherup

On October 19, 1984, the Board of Education approved the terms of reference for a detailed review of the effects of polluted school environments on education (see Appendix D). The firm of Bruce M. Small and Associates Limited was hired to conduct the study and prepare this report. Personnel directly involved in the study included:

Project Manager: Otto Langmark, Planner-Demographer
Toronto Board of Education

Principal Consultant: Bruce M. Small, P.Eng.
Small and Associates

Principal Researcher: Wendy Priesnitz
Wendy Priesnitz and Associates

Research Associate: Barbara J. Small
Small and Associates

FOREWORD

For the past decade and a half, the Trustees of the Board of Education for the City of Toronto have taken an active interest in environmental pollution problems in Toronto and in the effect of the school environment on students and staff. Our attention has focussed on such matters as lead pollution, smoking, weed control, pesticides and integrated pest management, industrial odours, use of chemicals in schools, asbestos, fluorescent lighting, video display terminals, noise, and painting in schools.*

Since the Pollution and Education Review Group began its study in October of 1984, we have become ever more aware of the seriousness of the effects that pollution can have on education and health. We have also been frustrated to hear the extent to which students and teachers within our own school system have gone unheeded in their warnings about the effects that they have personally suffered.

We have begun to understand that progress in reducing the health effects of pollution in Toronto has been blocked for many years by stubborn attachment to assumptions which are proving false. It is becoming abundantly clear, for example, that many people are being badly affected by pollution levels and by products that have hitherto been considered safe. We have taken decades to understand that each individual is unique, and that present pollution standards are not protecting everyone.

One of the parents who wrote to us summed up her concerns by saying:

> **"A child's body is far more accurate than any machine".**

She and many others are frustrated that officials at many levels often rely more on environmental measurements and on their own assumptions about what is safe and what is not, than on observation of the children for whom the system is intended. We would do well to open our eyes once more and look carefully at what is happening.

Our own frustrations are aptly described by Dr. David Suzuki in his March 2nd, 1985 column in the Toronto Star:

> **"What is astounding to me is that there is not an immediate concern for the health of the people affected. I would have thought that any sensitive person, whether a business person or government bureaucrat, would, above all, be horrified at the prospect of people being adversely affected by some environmental factor".**

As Education Trustees, we will do our part to take action within schools. We request in turn that other levels of government and other professions look more seriously at the effects of pollutants in our outdoor environment, and at the emissions of literally hundreds of twentieth-century chemicals from products and materials used indoors on a daily basis.

We also urge everyone to look upon the school environment not as one more headache, but as a golden opportunity. If cleaning up our classrooms and our neighbourhoods could improve health and enhance the quality of education in Toronto, we and our children will be the richer for it.

The Trustees
Pollution and Education Review Group
Board of Education for the City of Toronto

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*Extracts from Relevant Minutes of Board of Education Meetings are included in Appendix E.

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*Appendices E and F are supplementary volumes, available for perusal at the Board. Enquire Admininstration Services, 155 College St., Toronto M5T 1P6.

EXECUTIVE SUMMARY

The evidence presented to the Pollution and Education Review Group during the course of this study is clear:

a) It shows that staff and students are exposed to many pollutants which originate both within their schools and in the neighbouring communities. Many of these pollutants can affect brain function, learning ability, behaviour, and hence education. They may also present a general health hazard.

b) The sources of pollution range from industrial emissions and automobile exhaust outside, to painting, cleaning chemicals, art and science materials, tobacco smoke, and even chalk dust, inside. There is evidence that in some schools the ventilation may have been insufficient to adequately exhaust the pollutants being generated inside.

c) Some students and staff are experiencing acute adverse effects from such exposures, while others do not appear to be suffering, at least in the short term, from the same exposures. Recent evidence indicates that this situation reflects the wide range of vulnerability to pollutants within our population. Some people suffer even at very low levels of contamination, well within previously accepted guidelines for tolerable levels of pollutants.

The members of the Pollution and Education Review Group feel strongly that the Board of Education must not enter into a debate about how much pollution students and staff should be able to stand and still pass their courses or teach their classes. The Board is responsible for helping children and adults in Toronto get an education. If pollutants are getting in the way of that education, then people must not be allowed to release those pollutants into our environment.

The point of most concern to the Board of Education should be whether current actions both within its own jurisdiction and by various other levels of government will eradicate Toronto's pollution problems as quickly as is humanly possible. The authors and the Pollution and Education Review Group have concluded that not enough is being done.

The immediate focus must be toward the individuals whose health, education, or working experience have already been badly affected by exposure to pollutants either within Toronto schools or in nearby neighbourhoods. Detailed followup work must be done to address the specific problems that many individuals are having now, every day, in Toronto schools. In the course of doing so, the Board and school staff will build an expertise in trouble-shooting pollution and education problems that will become the basis for prevention in the future.

At the same time, the Board of Education should act quickly to bring consideration of pollutants up to full status with the many other factors that affect children and staff in our schools. The proper response to the information in this report is not an emergency one, but one in which new programs and habits gradually become part of routine at all levels in the system, and particularly at the classroom level, where knowledgeable teachers, students and parents can detect early warning signs and help the Board to short-circuit potential problems.

The Board, for its part, must begin to be more receptive to feedback from teachers, parents and students. Pollution is just one of the many aspects of the school environment, and over the coming decades there will be much to learn about all aspects. If the Board creates ways of responding smoothly to new knowledge about education, health and environment, the next round will be much easier than the last. In our present world it is the norm, rather than the exception, that new knowledge and new viewpoints must alter old assumptions.

The Toronto Board is only one part of a large network of organizations that influence our lives and our children's lives. Many of these organizations - industry, local government, provincial and federal governments, scientific and technical organizations, other Boards of Education - could all play a useful part in a co-ordinated response to the problems discussed in this report. The Board must reach out to these other organizations, but it should in return expect reasonable co-operation and interest in problems that concern all of us. This is particularly important where jurisdictions and responsibilities place the power to act in the hands of such bodies.

The following specific programs are recommended in the report:

1. **Determine school-safe materials and activities, and find alternative schedules for painting and renovating**

2. **Establish a trouble-shooting group of technical staff to solve pollution problems, and designate environmental study schools for establishing procedures**

3. **Implement new ways of getting feedback, and carry out followup interviews with respondents to help solve problems**

4. **Increase awareness of the effects of pollution through to the classroom level, starting by preparing learning materials**

5. **Upgrade the board's pollution measuring capability, starting by consulting with experts on an economical strategy**

6. **Provide experimental low-pollution classrooms, starting with studying the need and recommending locations**

7. **Discourage all smoking in schools, starting by designating some experimental no-smoking schools**

8. **Explore the role of the internal and external environment in chronic learning problems, starting by establishing a study group**

9. **Mandate the Board's Pollution and Education Review Group to approach outside organizations regarding pollution, starting by:**

    - **approaching other boards re joint action**
    - **approaching other government levels re funding**
    - **encouraging action by government agencies, including development of air quality guidelines suitable for children in schools**
    - **encouraging further research by others**

10. **Prepare a detailed implementation and financing plan, including reallocation within the 1985 program, to initiate the above actions.**

*** ***

1. INTRODUCTION

Can indoor and outdoor pollution affect education? Our evidence says "YES". This report reviews that evidence, and discusses the significance of it for the Board of Education for the City of Toronto. The terms of reference guiding our review are reprinted in Appendix D.

Must you read this whole report to understand how? The answer is "NO". We have written different sections of this report from different points of view. Each person reading it will have his or her own reasons for doing so. To meet your needs right now, reading one or two sections may be more than enough. This section will help you choose where to start.

a. understanding the hard facts (Section 2 and Appendix C)

We reviewed the scientific literature on pollution and education and summarized what it said. For those people who want to see hard facts, Sections 2.1 to 2.3 highlight the evidence we found. Sections 2.4 to 2.6 give our opinions as to how important this evidence is, what gaps there are in the evidence, and what we think can be concluded from it.

Some people will not be satisfied with our interpretation. Appendix C lists every reference we consulted, shows when and where it was published, and gives a short abstract of the research or article. We hope this will be a handy reference section, serving many purposes. If you interpret the facts differently, please let us know. If you find more evidence that you think we should look at, please bring this to our attention.

b. understanding the people side (Appendices A and B)

Some people prefer to hear about a problem straight from those who have experienced it. During the study, we held two public hearings. We also received many letters from people who were concerned about this subject, or who were themselves badly affected by pollution. Many parents told us that their children's education was suffering due to the school environment.

Appendix A contains a detailed summary of the discussions that took place at the meetings. Appendix B summarizes the many letters we received. Before tackling other sections of the report, we would recommend that you spend a few minutes and read a page or two in these sections. Hearing people's personal experiences has helped us a great deal to understand this subject, and we are grateful for the help those who contributed have given us.

To keep the report's size down, we summarized what we received. If you wish to read the letters themselves, please consult a bound volume called 'Appendix F' at the Board of Education's Adminstrative Services Department at 155 College Street in Toronto. In that volume and in the appendices here, names have been omitted to protect the privacy of people who wrote to us. Some people wrote strictly in confidence, and their letters do not appear in Appendix F. We have, however, included their suggestions and ideas within the report.

c. what about local issues? (Section 3)

Many readers will want to know what we thought about specific problems right here in Toronto - events that are real and close rather than theoretical or hypothetical.

Section 3 makes it very clear. Pollution does affect education in Toronto, and there is much that could be done to improve things. We have reviewed many issues, from the effects of nearby factories on children, to the problems caused by painting school hallways while children and teachers are still in nearby classrooms. We have discussed the burning of PCB's in city neighbourhoods, and the need for better attention by doctors to the problems caused by pollution. Many people have not been taken seriously in the past when they tried to talk about pollution problems. In Section 3.4 we have made a few suggestions that could make it easier to be heard in the future. Certainly the main message of this report is that people's concerns about pollution and education must be taken seriously.

d. finding the details (Indexes)

Many people who read this report will have something very specific in mind that they want to know about. Where to find it may not be obvious from the table of contents. For this reason we have prepared a detailed index which you will find in the back of the report.

e. what about the bottom line? (Section 4: Recommendations)

Where does all this lead? Some of you may wish to turn directly to Section 4, where we have written our recommendations. Section 4.1 is a discussion in plain English of what we think should be done, and why. Section 4.2 presents the detailed recommendations in the form of a motion to the Board of Education from the Pollution and Education Review Group. Section 4.3 lists the titles of the recommendations for easy reference.

And in a nutshell, what have we said? — that pollution is important, that teachers, students and parents need to be listened to, and that the Board must learn how to fix 'problem' environments, whether they are single classrooms or whole schools. We have said that it is important for everyone at school and at home to be more conscious of things that cause pollution — everyone has a role to play in keeping a school safe for our children.

And finally, we have noted that knowing about pollution can be an opportunity, not a problem. Fixing environments may improve the health of many children, and may improve the quality of their education.

f. hearing more from you

There is a great deal to learn about creating suitable environments for learning. The Board staff and Trustees would be grateful to receive any additional comments, suggestions or experiences readers can offer. Please contact Otto Langmark, Planner-Demographer, Board of Education for the City of Toronto, at the address given on the cover page at the beginning of this report.

2. POLLUTION AND ITS EFFECTS ON EDUCATION SUMMARY AND ANALYSIS OF THE LITERATURE

This section summarizes our review of the scientific literature concerning the effects of pollution on health, behaviour and learning. Complete abstracts of all the references consulted during the study have been included in Appendix C "Detailed Bibliography and Abstracts" for further reference.

The following pages deal only with the highlights of the literature, in order to illustrate some of the conclusions that have been reached during the study. The sequence of major findings supported by the references can be traced by following the subheadings which are printed in bold throughout this section. The whole review addresses this general question:

"Can exposure to pollutants affect education?"

Section 2.1 reviews how pollution can affect education - primarily through its effects on health, behaviour and brain function. Section 2.2 illustrates, with examples from the literature, how students and staff in schools could be exposed to some of the pollutants discussed in Section 2.1. Section 2.3 acknowledges that many other factors could give similar effects to those that are discussed in Section 2.1.

Our general answer to the question above is "yes - exposure to pollutants can affect education", but as you will see from the discussion, this is an oversimplification. Another way of answering the question, perhaps more correctly, is that **some** exposures to **some** pollutants will affect **some** people's education **some** of the time. That is, being affected by pollutants is often a very personal affair - everyone seems to have a different tolerance, and if you are affected, your symptoms may be very much different than those of your neighbour even under the same exposure.

The literature review has been deliberately broad, and includes references to schools in various parts of the world. However, we have tried to concentrate most on those observations and conclusions which are likely to be relevant to schools in the City of Toronto.

At the same time, we recognize that there are many similarities among schools throughout the developed world, and that some of the material cited may be of interest to education officials, staff, parents and students elsewhere in Canada and in other countries. Readers who wish to exchange information and experiences with officials in the Toronto Board of Education are invited to contact Otto Langmark, Planner-Demographer, Board of Education for the City of Toronto, or the consultant team. Addresses and telephone numbers are given at the beginning of this report.

Section 2.4 discusses the relative importance of pollution among the many factors discussed in section 2.3. We have concluded in general that pollution is important enough that it cannot be ignored. The more complete answer recognizes that everyone is different; for one individual, the effect of pollution may be critically important, while for the next, ten other factors may be more important. If one had to highlight one lesson that this review produced, it would be that to solve pollution problems, you cannot ignore the individual. General air quality standards cannot always provide the solutions.

Section 2.5 discusses gaps in our knowledge, and finally Section 2.6 summarizes some general conclusions about pollution and its effects on education. In a nutshell, it says that pollution can and does profoundly affect education for many individuals. Even though the gaps in our knowledge in this field will take decades to fill, sufficient is known now about the potential effects of pollution on education to justify incorporating our present knowledge into day-to-day decision making in our schools.

2.1 How Can Pollution Affect Education?

Pollution has many ways of affecting education. The most obvious is a direct effect on health - if a child is ill and away from school, his or her education may suffer. If a child is attending school but is not feeling well, again learning may suffer. Less well known is the fact that for some people, pollution exposures (and other factors) can directly affect the brain - causing changes in behaviour and learning ability that range from very subtle differences (e.g. less enthusiasm, slight difficulty thinking) to very dramatic reversals of personality or capability (e.g. aggressive behaviour, inability to remember, gross handwriting changes, etc.).

Teachers can be vulnerable to pollutant exposures as well, and the effects can be similar - direct health effects as well as changes in behaviour and performance. Teachers are the primary resource within our school system. If a teacher is away or performing below par, the opportunities for student learning will be affected.

The following section summarizes key observations from the medical and scientific literature concerning pollution and its effects on education. Readers may also consult a more complete review of each reference in Appendix C. Subsections 2.1.1 to 2.1.3 treat first the general effects of polluted environments on health, then more specific health effects of individual pollutants, followed by behavioural and learning effects.

2.1.1 General Health Effects of Polluted Air

Can polluted air cause illness? Many researchers think it can, at least for some people, and evidence in support of this idea is increasing.

a. some people still feel sick, when levels are below toxic limits.

There is still much debate as to how pollution causes illness. Some researchers argue that significant effects are only seen at so-called "toxic" levels, where exposures are sufficiently potent that anyone in the population might experience discomfort or illness. Others argue that there are many people who are adversely affected even if pollutant levels are well below toxic levels (C.F. Reinhardt, 1978).

It also appears that chronic low-level exposures to many twentieth century chemicals over a long period of time may be as dangerous, if not more so in some cases, as intense high-level exposures that we are more used to thinking of as toxic. T. Damstra (1978) has studied the subtle, subclinical effects that may result from such long exposures and feels that many chemicals have been inadequately examined for their low-level long-term toxicity.

Although some situations could conceivably present toxic pollutant levels in Toronto schools (e.g. an industrial spill in a nearby neighbourhood, a biology lab without proper ventilation, improper use of volatile cleaners or glues, etc.), the more common situation appears to be one in which multiple chemicals are present at lower, less toxic or non-toxic levels. The problem which triggered this present study is a simple paradox: some people are still experiencing illness and other effects when the levels are measured to be below toxic limits.

b. chemicals acting together may have different effects than when acting alone; so-called "safe" levels may be inaccurate

One possible explanation for effects at low exposure levels is the combined action of many chemicals present at the same time. R.K. Severs (1980) described the synergistic effects of pollutants, where substances such as sulphur dioxide, nitrogen dioxide, carbon monoxide and hydrocarbons can interact to create a greater danger than the equivalent level of each substance would by itself. Severs feels that experimental studies that expose humans to only one pollutant at a time have little relevance to real life where people are exposed to a virtual "chemical soup". He suggests that the so-called "safe levels" determined by such studies may therefore be inaccurate.

c. low levels of pollutants can affect highly susceptible persons

Another key is that there appears to be a wide range of vulnerability in the population to the negative health effects of pollutants (L. Plumlee and S. Coerr, 1979, and E.J. Calabrese, 1978a). Some individuals may never contract illness as a result of exposure to pollutants, and others may be highly susceptible, for a variety of reasons. For the latter, pollution may contribute to or aggravate any of a wide range of illnesses. Low levels of chemical exposures commonly found in our communities, homes, offices and schools may indeed be sufficient to bring on discomfort and even physical and mental disease, at least for some of us.

Dr. I.R. Bell (1982) combines the two theories. She believes that low doses of substances which singly might be benign may interact additively or synergistically on some common pathways in the body to produce illness. She also reports that a broad range of common physical and psychological disorders can be triggered in susceptible individuals by chronic and often low-level exposures to environmental chemicals and natural inhalants. But she feels that the timing of onset of an illness may depend on the total stress load on a person. That total load includes all of the psychosocial, physical, chemical, antigenic or infective stressors that impinge on the individual.

The phenomon of increased sensitivity has been recognized for some time in industrial situations. C.F. Reinhardt (1978), in a report on occupational medicine, describes workers who react to certain substances at low levels, below the threshold concentration associated with injury or definite discomfort. He is concerned that these particular workers, who are distinctly more susceptible than the majority, may be inadequately protected by control procedures that will suffice quite well for most employees.

Other clinicians and researchers support this view. For example. W.H. Philpott and D.K. Kalita (1980) have accumulated clinical evidence to show that low levels of environmental pollutants, both indoor and outdoor, can have debilitating mental and physical effects on highly susceptible persons. Philpott claims that an individual's ability to handle toxins, pollens, foods and chemicals taken in from the environment differs considerably according to his or her unique biochemical makeup.

This phenomenon whereby a person may be more sensitive to pollutants than his or her neighbours is often called chemical susceptibility or hypersusceptibility. C.F. Reinhardt (1978) defines it as a state of being readily affected or acted upon. The same phenomenon has been commented upon by a number of other researchers as well, including W.C. Cooper (1973), D.R. O'Banion (1981), L.D. Dickey (1976), T.G. Randolph and R.W. Moss (1980), W.J. Rea, I.R. Bell and co-workers (1978), and others referenced in turn by them. Complete abstracts of their reports can be found in Appendix C.

d. for persons who have become chemically susceptible, high levels of air pollution represent considerable risk

Drs. Rea and Bell also describe what they call a characteristic "spreading phenomenon". Once an individual is sensitized to a solitary chemical, continued exposures may result in adverse reactions at lower levels of exposure to that same chemical, and to low level exposures of other chemicals as well. No mechanism has yet been confirmed to explain how this spreading effect may take place in the body.

They note that for persons who have become chemically susceptible, high levels of air pollution represent considerable risk. Follow-up studies in patients who have become sensitized to numerous pollutants showed that it took people a long time to recover, and that to improve at all depended on lowering their load of pollutants as much as possible. They caution that the condition of some patients who were not able to avoid the substances that were affecting their health rapidly deterioriated.

The medical literature does indicate continuing controversy over the mechanisms by which the body reacts to low-level chemical exposures. The debate centres on the role of the chemicals - do they act as toxins, irritants, or allergens? Although many of the symptoms of reaction to pollutants may resemble allergy or allergic-like reactions, W.H. Philpott (1980) notes that many of the reactions observed do not show antibody formation and therefore cannot fit into the immunological definition of allergy.

W.J. Rea (1978) suggests that cumulative low-level chemical exposures may be responsible for a general immune suppression effect underlying the susceptibility phenomenon. His research demonstrates that in some chemically susceptible patients there may be suppression of cells known as "T-cells" (a normal component of the immune system, found in the blood). Tests in controlled environments showed that the populations of these cells returned to higher levels when the patients were kept away from offending chemical exposures.

It would be a mistake to assume that chemically susceptible individuals represent a fixed population, as if they had inherited a congenital handicap. While heredity may play a role, it is also known that a general susceptibility can be triggered in people who have no obvious predisposing medical history (W.J. Rea, I.R. Bell et al, 1978). This was demonstrated most dramatically by exposure to urea-formaldehyde foam insulation (B.M. Small, 1982). A number of people were reported to have developed a full range of sensitivities as a result of exposure to UFFI gases.

A number of chemicals are known specifically to possess sensitizing properties. I.K. Ostapovich (1975) found that in animal studies, exposure to formaldehyde in concentrations of 4.6 ppm and 1.3 ppm led to the early onset of allergy. This was accompanied by signs of toxic effects at the 4.6 ppm level but with statistically insignificant indications of toxic effects at the 1.3 ppm level. J.R. Nethercott (1982) refers to the sensitization process as an alteration in irritancy threshold. H.R. Imbus (1982) states that it is allergic sensitization if it involves a specific immune response in an individual who becomes allergic to a substance. Toluene di-isocyanate, a chemical involved in the manufacture of polyurethane foams, is another example of a known sensitizing chemical.

e. all school populations may include people who are at higher risk than most from pollutant exposures

More generally, there are a large number of factors that may contribute to the wide variation in pollutant tolerance in the population. We all suffer variations in our ability to process chemicals as a result of many natural event in our lives. This ability may even vary at different times of the day. Viral illness, nutrition, and other factors may change our tolerance.

A number of researchers have listed various groups that may be more vulnerable than the rest of the population (E.J. Calabrese, (1978a), L.A. Plumlee and S. Coerr (1979), M. Wright et al (1979), and M. Utidjian (1979)). The following is a composite list derived from these sources:

the developing fetus
pregnant women
the very young
the very old
smokers
people with allergies or acquired immunologic sensitivity
people with existing respiratory disease
people with existing cardiovascular disease
people with other specific diseases
people with certain nutritional deficiencies
people taking certain drugs or consuming large amounts of alcohol
people with certain genetic variations or abnormalities
people who are especially exposed to high levels of chemicals

There have been few estimates made of the total numbers of people represented by these more vulnerable groups. However, N.E. Collishaw and co-workers (1984), from the Department of National Health and Welfare Canada, estimated that risk groups who were more sensitive to tobacco smoke totalled some 21% of the Canadian population (including people with heart disease, acute respiratory disease, emphysema, asthma and hay fever).

Being in a high risk group does not mean, however, that you will get sick whenever you are exposed to pollution. It means, rather, that it is a little more likely that victims (if any) come from these groups, than from the rest of the population. As noted before, it is at the same time true that some people with no known risk characteristics can be affected.

There is very little in the literature to say whether or not children from kindergarten to university age can be considered a special risk group. Some of the references are very vague about the meaning of 'young children'. Other researchers feel strongly that permitted levels (or so-called "safe" levels) of many pollutants may be too high for young bodies. A. Schauss (1980), for example, makes the point that children absorb and retain a greater percentage of ingested lead than adults. He stresses that lead levels formerly considered safe have recently been shown to increase abnormal behaviour, cause learning difficulties and reduce intelligence in children.

Among the children and staff in any school population, regardless of the age factor, there will inevitably be people with one or more of the other characteristics we have discussed. It is reasonable to assume that virtually all school populations contain some especially vulnerable individuals.

In any situation where illness or other effects are present, and pollution is suspected as a possible cause, it may be important to investigate all of the possibilities presented in the preceding section:

1. toxic levels of pollutants may be present

2. pollutants may be present at lower than toxic levels, but individuals present are sensitive enough to be affected at such levels

3. pollutants are present at lower than toxic levels, but long-term exposure has caused toxic effects that were not anticipated

4. pollutants are present at lower than toxic levels, but in combinations causing synergistic effects that were not anticipated.

It is also prudent to recognize that early notions about toxic levels themselves may have been wrong. There are numerous examples of chemicals for which allowable exposure limits have been lowered over time, as new information gradually reveals the true potency of commonly used chemicals (e.g. polychlorinated biphenyls - PCB's).

2.1.2. More Specific Effects of Pollutants on Health

The following section contains a sampling of citations in the medical and scientific literature which demonstrate the nature of health effects from common outdoor and indoor pollutants. It is not intended to cover all possible air pollutants, but rather to make the point that the literature does indeed support the idea that pollution may affect the health of some of the school children and staff in Toronto schools.

Situations reviewed may deal with toxic levels, sensitivity effects, or effects from long-term chronic exposures. Later discussion in section 2.5 acknowledges the limited application of some of the research, and notes that some of the studies and experiments cited in the literature may have been carried out at higher pollution levels than may take place within Toronto situations. Caution must be exercised when attempting to extrapolate conclusions to situations the data did not originally cover.

The reader is also referred to additional relevant references and abstracts which can be found in Appendix C, which have not been discussed here because of time and space limitations. These may be located for any topic of interest by consulting the subject index at the end of the report.

a. children in areas of high pollution can have more illness than those living in cleaner air

A number of researchers have suggested that carbon monoxide, nitrogen dioxide, sulphur dioxide and other such pollutants in urban air are associated with levels of respiratory illness in children that are higher than those of children who live in less polluted areas. Sulphur dioxide in the Toronto atmosphere is one of the gases that contributes to "acid rain". It is also a byproduct of lead smelter operations, which have been a topic of concern both to the Board of Education and to communities adjacent to such plants in Toronto. Carbon monoxide and nitrogen dioxide are products of both industrial and automotive combustion. Reference to specific high-pollution areas in Toronto can be found in section 3.3, later in this report.

Respiratory and ventilatory functions can be negatively affected in children in response to urban air pollution. K.F. Kerrebijn and co-workers (1975) measured these in fourth and fifth grade school children living in two areas that differ in air pollution but are comparable with respect to social and demographic factors. Children living in the high polluted area showed a higher prevalence of cough, which is assumed to be due to the difference in pollution level.

M. Saric and co-workers (1981) conducted a study in which, for a five-month period, forced expiratory volumes (FEVs) of seventy-eight second grade children living in a high sulphur dioxide and smoke pollution area were compared with FEVs of seventy second-graders living in a clean air area.

The incidence of acute respiratory diseases in these children and their families was also comparatively studied during the same period. The results of the study suggest that at the actual average annual exposure to sulphur dioxide and smoke experienced by the children in the high pollution area, with frequent higher daily concentrations during the heating season, certain negative effects on the ventilatory functions and occurrence of acute respiratory diseases can be expected.

I.K. Ostapovich (1975) has studied sulphur dioxide as one component of urban air pollution and found toxic health effects including changes in blood hemoglobin concentrations and erthrocyte counts.

R. Ehrlich and co-workers (1977) investigated the effects of single and multiple daily 3-hour exposures to nitrogen dioxide (1.5 to 5.0 ppm) and ozone (.05 to .5 ppm) mixtures on the resistance to streptococcal pneumonia. They feel that a synergistic effect might be present upon repeated inhalation of pollutant mixtures, that makes pollutants more effective in reducing resistance to respiratory infection.

P. Kruus and I.M. Valeriote (1979) relate respiratory system irritation to sulphur dioxide exposure, saying that at concentrations greater than 3 ppm it becomes irritating to sensitive membranes of the throat and lungs. Asthmatics and other susceptible people with chronic respiratory problems may be more readily affected by low concentrations. T.J. Witek and co-workers (1984) measured subjective respiratory complaints in asthmatics and healthy subjects during exposure to low-levels of sulphur dioxide in an environmental chamber. Asthmatics complained more of lower airway irritation such as wheezing and chest tightness while healthy persons noted more upper airway irritation such as taste and unusual odour. Exercise increased complaints in asthmatics, but not in healthy persons.

Common outdoor pollutants have shown similar effects indoors, according to further studies. B.G. Ferris Jr. and co-workers (1979) and R.J.W. Melia and co-workers (1980) found an association between respiratory illness in children and nitrogen dioxide arising from the emissions of gas combustion in the home (e.g. gas stove). F.E. Speizer and co-workers (1980) also report similar findings. As part of a long-range, prospective study of the health effects of air pollution, they studied approximately 8,000 children from 6 years to 10 years of age. Children from households with gas stoves had a greater history of respiratory illness before age 2, and slightly lower levels of forced expiratory volume (FEV) and forced vital capacity (FVC) corrected for height.

b. even a limited amount of exposure to ambient tobacco smoke gives a non-smoker a greatly increased risk of premature mortality.

One of the easiest ways of learning about the effects of pollutants is to examine the literature on the effects of tobacco smoke. A great deal of research has been done on this pollutant, primarily concerning its carcinogenic effects, but also to some extent respiratory, cardiovascular, allergic and other health effects.

Tobacco smoke represents by itself a complex mix of combustion products, including highly irritating gases such as acrolein, and highly carcinogenic substances such as benzo-a-pyrene. Second-hand smoke may contain hundreds of components, most or all at less than toxic limits. Yet it does cause illness. Its inclusion at some length in this discussion serves three purposes:

1. to remind the reader that despite the emotional factors surrounding debates about smoking, medical evidence is clear that exposure to tobacco smoke carries risk, and that smoking in schools can adversely affect students and staff

2. to demonstrate that for one of the few complex mixes of pollutants at low concentrations that has been well investigated, the results are that health is badly affected

3. to suggest, without proof, that other complex mixes of pollutants at low concentrations may similarly prove to be damaging.

Cigarette smoking has been found to be causally related to cancer, cardiovascular disease, and pulmonary disease. J.L. Repace (1983) presents evidence, some of it disputed, that breathing tobacco smoke from cigarettes smoked by other people greatly increases the risk of lung cancer. Based on a 1,078,894 person prospective epidemiological study, reported by J.L. Repace and A.H. Lowrey (1982), statistically significant dose-response relationships between exposure to second-hand tobacco smoke and loss of life expectancy have been calculated. From examining the data according to mortality by degree of inhalation of tobacco smoke, they showed that a limited amount of exposure to ambient tobacco smoke by nonsmokers carries a greatly increased risk of premature mortality.

N.E. Collishaw and co-workers (1984) report that tobacco smoke is a health hazard for nonsmokers who are regularly exposed to it, with the consequences of long-term exposure including decreased lung function and lung cancer. He feels that the one-fifth of the population with pre-existing health conditions that are aggravated by exposure to tobacco smoke are at an even greater level of risk.

c. children in homes with smokers have more illness than those in non-smoking families

A number of studies have gathered data about children in smoking and non-smoking homes. For example, one recent study indicated higher rates of certain respiratory conditions among children who live in households with adults who smoke cigarettes. G.S. Bonham and R.W. Wilson (1981) analyzed data from the 1970 National Health Interview Survey. They found that children in families with no smokers had an average of 1.1 fewer restricted activity days and 0.8 fewer bed disability days per year than did children in families with two smokers. Children in families with one smoker were in between. Acute respiratory illness accounted for the difference in disability days among children in families with different smoking characteristics.

They also measured family smoking by the combined number of cigarettes smoked by the adults; children in families which smoked 45 or more cigarettes a day had 1.9 more restricted activity days and 0.9 more bed disability days due to acute respiratory conditions than did children in families who did not smoke cigarettes. The age of the child, the number of adults in the family, the education of the family head, and the family income were all controlled and did not eliminate the relationship between children's health and family smoking.

I.B. Tager and co-workers (1979) studied young children in East Boston, Massachusetts and found that cigarette smoking by parents has a measurable effect on the pulmonary function of their children. A crude inverse dose-response relationship was observed between the level of forced expiratory flow predicted of children who never smoked and the number of smoking parents in the household. Compared to children with two non-smoking parents, the level of forced expiratory flow predicted was 0.156 and 0.355 standard deviation units lower for children with one and two currently smoking parents, respectively.

The role of passive smoking on children's respiratory health was also studied by H. Kasuga and co-workers (1979). They conducted a study of respiratory symptoms in 1,937 Tokyo school children aged 6-11 years. The prevalence rate for symptoms was associated with their families' smoking habits and their residential conditions; the prevalence rate was the highest among heavy-smoker families living in the area along a main highway (within 50 metres), and the lowest in non-smoker families regardless of their residential areas. V. Hasselblad and co-workers (1981), in a standard test of breathing performed on over 16,000 children, found that maternal smoking habits had a negative effect on children's breathing capacity.

R. Dodge (1982) studied a large group of Arizona school children who had been exposed to second-hand tobacco smoke and found a significant relationship between parental smoking and symptoms of cough, wheeze, and sputum production. Other effects of smoking include increased susceptibility to other pollutants (L.M.Reid, 1979) and subtle changes in neonatal learning and activity due to residual carbon monoxide in the air (R.J. Jaeger, 1981).

d. Vehicle exhaust fumes also have many adverse effects

Traffic fumes provide another example of a complex mix of combustion products. Similar effects are found as were described for tobacco smoke. Gasoline and diesel exhaust are common pollutants within the City of Toronto, and are absorbed by virtually all of the students and staff within the system on their way to and from the schools, and to a lesser extent, during the school day.

Respiratory disorders have been found, in many cases, to result from exposure to air pollution generated by automobile traffic. T. Nagira and co-workers (1981) studied children in schools located along Japan's Route 43, which has that country's highest congestion of vehicular traffic, and found that they have increasing rates of respiratory disorders.

Nitrogen dioxide concentrations near Route 43 in Japan have exceeded the short-term exposure limit (0.10-0.17 ppm) proposed as the guideline for the protection of public health by a World Health Organization (WHO) Task Group, which also recommended that this limit be stricter for sensitive subjects such as children.

In 1979, Nagira and co-workers polled children concerning respiratory, rhinopharyngeal and eye disorders in two elementary schools facing the highway and one school in a non-polluted area, using a self-administered questionnaire. Children attending the two polluted schools had higher rates of disorders relating to bronchial asthma, recurrent respiratory infection and allergies.

A close relationship was also found between the prevalence of such conditions and distance from the highway, and this gradient corresponded to the level of nitrogen oxides. Air conditioners furnished at schools appeared to have some remedying effect on these disorders. Children who lived south of the highway had higher rates of disease due to higher concentration of exhaust carried at night by northerly winds.

Enhanced susceptibility to bacterial infection resulting from exposure to diesel exhaust is suggested by experiments conducted by K.I. Campbell, E.L. George and I.S. Washington Jr. (1980). Groups of mice were first exposed for various durations to diluted exhaust from light duty diesel engines and then briefly to an infectious aerosol generated by nebulizing cultures of a bacterial pathogen (streptococcus). Typically, post-infection mortality was significantly greater in groups exposed to exhaust than in their corresponding control groups exposed to purified air only.

Data of recent diesel experiments and of past diesel and catalyst-treated gasoline engine exhaust experiments suggest a somewhat greater mortality from (and enhanced susceptibility to) bacterial infection in mice exposed to diesel exhaust than in those exposed to catalytic gasoline exhaust. Limited data on acute tests of nitrogen dioxide and acrolein vapour alone suggest that the infectivity-enhancing effect of diesel exhaust could be accounted for in large part by these components.

Also found in diesel exhaust are polycyclic aromatic hydrocarbon (PAH) compounds which D.V. Lassiter and T.H. Milby (1978) have identified as the most potentially hazardous agents found in diesel engine exhaust. Although a properly maintained diesel engine would be likely to emit extremely small amounts of these agents, the possibility that they might be carcinogenic to humans singles them out for careful attention when dealing with the effects of exhaust on children.

Carbon monoxide concentrations resulting from engine exhaust in enclosed areas can result in acute discomfort to exposed individuals. D.E. Anderson (1971) investigated episodes of illness in ice arenas from excessive levels of carbon monoxide and nitrogen dioxide resulting from the operation of ice resurfacing machines. Carbon monoxide concentrations up to 250 ppm following one episode of illness were found and nitrogen dioxide concentrations of 45 ppm following another. Typical symptoms were headache and nausea among children and headache among adults, and in one case, symptoms included a sore throat and chest tightness.

Substances such as asbestos are also of concern as byproducts of automobile use, through the erosion of brake linings and clutch plates (K. Kahler, 1984). Asbestos has long been known as a threat to health. It causes asbestosis - severe scarring of the lungs caused by continually inhaling asbestos over the course of many years. The symptoms begin with shortness of breath, which develops into near paralysis that makes breathing and body movement increasingly difficult, leading to ultimate suffocation. It is now accepted that asbestos is also an agent for cancer of the abdomen, liver, gastro-intestinal tract and lung (P. Kruss and I.M. Valeriote, 1979).

Levels of asbestos fibres in urban air may be high enough to present a hazard, especially in high traffic areas or at intersections. D. Baxter and co-workers (1983) measured airborne asbestos levels in the inhalable particle range at ten sites in California using transmission electron microscopic analysis of cyclone sampler filters. Of particular interest here are elevated levels at locales of heavy traffic braking due to asbestos in automobile brake and clutch mechanisms. The Environmental Protection Agency (U.S. is studying a recent request from the Natural Resources Defense Council, an environmental law group, to ban asbestos in brake linings (K. Kahler, 1984).

e. Formaldehyde can be an irritant and a sensitizer

Formaldehyde is another substance that is encountered in many situations by virtually everyone in the school system. It is a constituent of automobile exhaust, and is present in many household, commercial, and building products.

Proven health effects of formaldehyde include irritation to the skin, eye, lung and mucosal surfaces (J.R. Nethercott, 1983). D.M. Main and T.J. Hogan (1983) studied twenty-one subjects exposed to formaldehyde at levels between 0.12 and 1.6 ppm. and observed symptoms of eye, nose and throat irritation, increased headache and fatigue, chest tightness, and shortness of breath.

E.J. Bardana Jr. (1980) describes formaldehyde as capable of binding and altering human protein and inducing dermatitis by irritation. D.H. Harding (1982) suggests the threshold for irritation of formaldehyde is 0.1 ppm (which is also the guideline set by Health and Welfare Canada for UFFI homes). While affirming its capacity to irritate the eyes and upper respiratory tract, Bardana observes that recent studies also incriminate formaldehyde in the induction of an inflammatory bronchitis as well as bronchial asthma. Other symptoms experienced by some people when exposed to formaldehyde concentrations include nausea, dizziness, lethargy, flushing, laryngitis, depression, dopiness, extreme weakness, muscle spasms, joint or muscle pains, and vomiting (S.A. Rogers, 1985).

J. Pfeifer and co-workers (1983) studied a group of 159 school children, comprised of those who had undergone long-term exposure to formaldehyde as well as a non-exposed control group. They observed a statistically significant higher occurrence of abnormal findings in immunity indicators in the exposed group, over a three-month and a three-year period. The authors judge the results of this study to be serious enough to suggest that buildings built of prefabricated wood panels made with the use of a formaldehyde glue are unfit for long-term use by children.

Scientists have different opinions about the carcinogenicity of formaldehyde in humans, but animal studies indicate it may cause cancer (A.G. Ulsamer and co-workers, 1982). Formaldehyde is also one of the gases suspected to have been involved in making some people generally chemically susceptible after exposure to offgassing products of urea-formaldehyde foam insulation (B.M. Small, 1982). It is known clinically as a potential problem exposure, even at levels below 0.1 ppm, for people with severe chemical sensitivity.

f. polychlorinated biphenyls (PCBs) are a recognized hazard

A number of substances still present in our environment have been used widely in the past, only to be labelled subsequently as extreme health hazards. Among these, one class of chemicals that has been of particular interest in Toronto are the PCBs. It is by no means the only such hazard, but serves to illustrate the kinds of problems that could arise under accidental exposure to chemicals that were previously in wide use.

Polychlorinated biphenyls (PCBs) are substances with great chemical stability, a fact that has made them useful for several industrial purposes but now poses a problem since harmful effects have been discovered. The main Canadian application has been in electrical capacitors and transformers. The health effects of PCBs have been studied in animals and, to some extent, observed in humans. PCBs have been proven to be carcinogens in laboratory animals and reproductive damage in fish and birds has been documented.

In 1968 a severe incidence of human contamination occurred in Japan, resulting in 16 deaths and several stillbirths. As well, victims suffered lesions, blindness, hearing loss, chloracne, inflamation of the joints, liver damage, behavioural changes and subsequent birth defects. Testing indicated that PCBs were transmitted in utero from mothers to their fetuses and to infants via breast milk (Canadian Environmental Law Association, 1984).

T. Yulsman (1985) documents another environmental disaster concerning by-products from burning PCBs. In 1981 an electrical fire in the basement of an 18-story New York state office building was fueled by oil containing PCBs which were changed by the heat into a dangerous brew containing, among other substances, dioxin. Yulsman describes how the building's ventilation system carried these substances to all its occupants, exposing them to the risk of reproductive system damage, immune system damage, and cancer.

K.E. MacLeod (1981) states that indoor air often contains PCB levels at least 1 order of magnitude higher than outdoor levels. (The possibility of old fluorescent light ballasts contaminating indoor air is discussed in more detail in the section following, dealing more specifically with schools.)

Now that PCBs have been identified as a potential hazard, the primary problem is one of disposing of the existing stock - contained primarily in thousands of electrical transformers - without causing damage to the natural environment or to people. A spill of PCBs along the Trans-Canada Highway in Northern Ontario in mid-April 1985 highlighted the concern for Canadians. PCBs leaked from old transformers being trucked to disposal. In Toronto, PCBs are stored at industrial sites within residential neighbourhoods. The Province of Ontario has proposed to dispose of these by burning the waste oils in mobile burning units. The Board of Education has opposed this method on the grounds that there is inadequate knowledge of its effects, and that additional burning of anything, let alone toxic chemicals, is not acceptable in or near residential areas (see also Section 3.3 of this report).

g. Pesticides and herbicides can have serious health effects

Researchers differ in their opinions about the health hazards associated with exposure to pesticides and herbicides, but there is much evidence that these substances can be highly toxic to humans. J.E. Cummins (1982) has found that certain classes of pesticides commonly used in buildings (e.g. carbamates) react with nitrogen oxides in air to produce potent carcinogenic and teratogenic compounds (N-nitroso pesticides). Gas stoves, kerosene heaters, and other combustion equipment or activities, as well as infiltration of exterior air pollution, supply nitrogen oxides to indoor air. Over the period of exposure to the nitrogen oxides of deposited pesticide films, such as found on baseboards or in cupboards, substantial formation of N-nitroso derivatives of the pesticides occurs.

R.W. Shearer (1983) feels that irreparable tissue damage can be caused by many pesticides to the nervous system, the immune system, and genes in any tissue. She says that such damage may not produce symptoms immediately and may manifest only after the inducing chemical has been largely excreted.

Some herbicides have also been found to cause serious health damage. Reported health effects in humans and animal studies include respiratory problems; burning eyes; bloody nose; nervous system disorders; female-related difficulties such as uterine bleeding, miscarriages, stillbirth, painful ovulation; liver and kidney problems; unusual susceptibility to colds, flues or other illnesses; headaches, nausea, dizziness; and unusual reaction to alcohol. (W.K. Priesnitz, 1979).

R.W. Shearer (1983) is familiar with the medical histories of more than 30 people who have been acutely poisoned by 2,4-D, alone or in combination with other herbicides. Acute symptoms include nausea, vomiting, diarrhea, headache, temporary loss of vision, weakness, burning eyes, sore throat with burning in chest. Residual effects include bleeding tendency, concentration and memory problems, and hypersensitivity to non-physiologic chemicals.

h. heavy metal contamination can be a serious health hazard

Cadmium is another component of air pollution that can be highly toxic. It is a naturally-occurring heavy metal that is increasingly being released into the environment as an industrial by-product, as fertilizer residue, and as an ingredient of cigarette smoke (B. Gibson, 1985). Health effects due to tissue accumulation of cadmium can be red blood cell damage, lung damage and kidney damage or failure. A lethal dose is possible without warning due to lack of discomfort at the time of exposure. H.A. Schroeder (1973) also reports that cadmium causes hypertension or high blood pressure.

Lead, aluminum and mercury are discussed in detail in Section 2.1.3 following, in terms of their effects on behaviour and learning.

i. sensitivity to hydrocarbons appears increasingly common

In addition to the specific gases mentioned in previous sections, there are large categories of pollutants that are present both in outdoor and indoor air, each usually at less-than-toxic concentrations, which can adversely affect health.

These compounds include a large group of chemicals known as hydrocarbons, so-named because their basic components are primarily atoms of hydrogen and carbon, and which may occur as gases, liquids or solids. (Hydrocarbons with 1 to 4 carbon atoms are gaseous at ordinary temperatures, whereas those with 5 or more carbon atoms are liquids or solids).

C. Hollowell and R. Miksch (1981, p. 5) found hydrocarbon contaminants in greater number and concentration indoors than outdoors, in gas chromatography-mass spectrometry analysis of a typical office environment. The largest peaks in their readings fell into three main classes of compounds:

1. aliphatic hydrocarbons (mainly petroleum distillate-type solvents)

2. alkylated aromatic hydrocarbons (including toluene and xylenes, trimethyl benzenes, and other compounds which are either solvents themselves or constituents of naphthenic-type petroleum solvent mixtures

3. halogenated hydrocarbons (including tetrachlorethylene, 1,1,1 trichloroethane and trichloroethylene. Tetrachloroethylene is used in dry-cleaning processes)

Miscellaneous other compounds were observed, including ketones, aldehydes and benzene. Although concentrations may be different, this set of pollutants may also be typical of residential and school environments. Hollowell and Miksch attributed the contaminants to new and aged building materials, wet-process photocopiers, tobacco smoke and building maintenance products.

I. Johansson (1978) found in measuring contaminants in school rooms that aliphatic and aromatic hydrocarbons were predominant, followed by the halogenated hydrocarbons and a few other compounds such as acetone and ethanol. His study detected 160 compounds indoors, mainly hydrocarbons, compared to 50 such compounds outdoors. Concentrations were always found to be higher indoors than outdoors, and to increase when people were present in the room. (Some of these compounds are natural products of human metabolism).

Many such pollutants found in the modern school setting are suspected of causing adverse health effects. D.R. O'Banion (1981) reviews the role that sensitivity to chemical substances plays in human health. He refers to the school as one of the most chemically contaminated environments in our society, and documents how a number of chemical offenders can affect learning and behaviour. He lists a wide variety of indoor pollutant sources, and highlights pesticides, motor exhaust, and chemicals in clothing. According to O'Banion, fatigue, sleepiness and unco-operativeness are often produced by chemical exposures in schools, even among individuals that would be considered only mildly chemically sensitive.

T.G. Randolph (1976) lists some of the major sources of air pollution in schools that can have debilitating physical effects on children: fuels, solvents and their combustion products; insecticides; sponge rubber and plastics; automobiles; scented cleaning products; cigarette smoke; machinery; building materials with formaldehyde; and dust. In a number of other references, low level emissions from common products are linked with numerous adverse reactions in chemically susceptible individuals (W. Philpott, 1980, W.J. Rea and co-workers, 1978, B.M. Small, 1980, 1982, 1983, 1984).

A more detailed discussion of individual sources of the many hydrocarbon contaminants typically found in indoor air, along with a complete bibliography of additional references on this particular topic, can be found in a review of indoor air pollution in the residential setting, prepared for the Canada Mortgage and Housing Corporation (B.M. Small, 1983).

Readers will find typical examples of hydrocarbon sensitivity described among the briefs and presentations by teachers and parents, in Appendices A and B.

2.1.3 Specific Effects of Pollutants on Behaviour and Performance

As well as the physical effects just discussed, some pollutants can affect behaviour and performance. Behavioural and learning-related effects may occur after either transient or chronic low-level exposures to certain chemicals. W.H. Philpott and co-workers (1981) observe that maladaptive central nervous system reactions to chemicals can occur in susceptible people. Behavioural alteration is now used as an early sign of toxicity and as suggestive evidence that a particular chemical agent may produce long-term impairment in susceptible individuals.

T. Damstra (1978) suggests that subtle, subclinical changes in behaviour may be the result of selective damage to particular areas of the central nervous system by chronic exposure to some substances. She states that certain groups, such as the young and the elderly, may be especially vulnerable. K.A. Johnson and B. Batts Young (1982) review a wide range of substances, such as pesticides, synthetic environmental chemicals, drugs, and food additives that have been linked with unexpected behavioural disturbances, including hyperactivity and paranoia.

In some individuals, subtle neurological deficits and behavioural impairments which may have resulted from early exposure to environmental chemicals are often not recognized until the child enters school, when he or she exhibits a short attention span, hyperirritability, aggressiveness, and sensory and motor impairments. Conventional neurological examinations often fail to detect such instances of minimal brain dysfunction (B. Weiss and J. Spyker, 1974).

Weiss and Spyker feel that some health effects caused by long term exposure to low levels of chemical pollutants may be represented as a slow process similar to natural aging. And any process that reduces the brain's reserve capacity may, at some time late in life, because of degenerative losses, make the brain incapable of coping with any additional loads or stresses.

a. Lead has now been associated with hyperactivity, retardation and learning disabilities

B. Rimland and G.E. Larson (1983) reviewed 51 studies covering a wide range of behaviour, from learning disabilities through hyperactivity to giftedness and intelligence. In many of these studies, high levels of certain minerals, especially lead and cadmium, were associated with undesirable behaviour and learning disabilities.

Lead exposure has been shown to be associated with neuropsychologic deficits that increase abnormal behaviour, cause learning difficulties and reduce intelligence, thus interfering with classroom performance. Such effects can be induced at exposure levels below both those levels producing symptoms severe enough to be diagnosed clinically and those levels formerly considered safe. It is now known that children can absorb enough lead to impair their performance on tests of reasoning, coordination, intelligence and reading. In addition, children with increased blood and dentine lead levels have been shown to exhibit hyperactivity, perceptual disorders, mental retardation, fatigue, irritability, temper tantrums, learning disabilities, speech disturbances, perceptual motor dysfunctions, and emotional or behavioural problems (A. Schauss, 1980).

H.L. Needleman and co-workers (1979) compared the performance of 58 children with high dentine lead levels and 100 with low levels. Children with high lead levels scored significantly less well on the Wechsler Intelligence Scale for Children than those with low lead levels. This difference was also apparent on verbal subtests, on three other measures of auditory or speech processing and on a measure of attention. Analysis of variance showed that none of these differences could be explained by any of 39 other variables which were studied. The classroom behaviour of all 2146 children whose teeth were analysed was also evaluated by a teachers' questionnaire. The frequency of non-adaptive classroom behaviour increased in a dose-related fashion to dentine lead level.

R.K. Byers and E.E. Lord (1943) also describe how lead poisoning at a very early age has an effect on the ultimate growth and development of the nervous system. They performed follow-up studies on a group of children who had been hospitalized as infants for overt lead poisoning, evaluating them using psychometric tests. Of the 19 children for whom IQ scores were available, 17 scored little better than 80. Of the six children whose IQ scores ranged from 95 to 106, only one did well in school.

Similarly, A.D. Beattie and co-workers (1975) studied infantile exposure to low levels of lead in drinking water. Water lead levels were measured in the homes occupied during the first year of life by 77 mentally retarded children aged two to six years and 77 non-retarded matched controls. In many cases, these homes were the same ones occupied by the mothers during pregnancy. The water lead content was significantly higher in the retarded group, and the probability of mental retardation was significantly increased when water lead exceeded 800 ug. per litre.

Although the number of children with acute disorders due to lead absorption appears to be decreasing, it seems that children with infantile autism and other disabilities after normal development up to age three are occurring in greater numbers. In many of these cases, elevated blood lead levels are present and J.J. Chisolm (1974) feels that it is quite possible that this chronic increased lead absorption contributes to the behavioural disorders.

Exposure to other heavy metals can compound these effects. J.J. Chisolm (1974) cautions that there is an important synergistic interaction between metals, including the essential ones, creating greater health hazards from a combination of metals than one might expect by totalling the effects of the individual metals.

J.A. Valciukas and co-workers (1978), C. Pfeiffer (1975), R.W. Thatcher and co-workers (1982) and A.H. Corwin (1976) have also investigated central nervous system dysfunction due to lead exposure. Interested readers are invited to review the abstracts of these papers, which can be found in Appendix C.

b. Carbon monoxide can cause subtle performance changes

Carbon monoxide is a common air pollutant that has been shown to have a variety of effects on behaviour and learning, although researchers differ as to the levels of concentration which first trigger such effects. As V.G. Laties and co-workers (1969) note, most investigators have traditionally discovered symptoms of carbon monoxide poisoning when the carbon monoxide level in blood (carboxyhemoglobin or COHb) was raised to between 10% and 20%. This occurs at carbon monoxide levels of 50 to 100 parts per million (ppm), with many symptoms becoming apparent when the COHb level is elevated beyond 25%. Recently it has been found that many subtle performance changes result from exposures to lower concentrations of COHb (R.J. Jaeger, 1981).

R.D. Stewart and co-workers (1970) found that exposures producing COHb saturations greater than 15 to 20% resulted in changes in the visual evoked response, impairment of manual coordination, and mild headache. V.G. Laties and co-workers (1969) describe a study where COHb levels of 20% affected the performance of subjects who were required to do 50 arithmetic problems, each involving five five-digit numbers. They took about 13 minutes to complete the task under control conditions but took about 17 minutes and made more errors when their COHb level was 20%.

The effects of carbon monoxide exposure upon the ability of 18 young adults to discriminate short intervals of time were studied by R.R. Beard and G.A. Wertheim (1967). Deterioration of performance was first observed after 90 minutes at 50 parts per million (ppm), and at proportionately shorter times after exposure to higher concentrations up to 250 ppm. Experiments with rats, using operant behaviour schedules of reinforcement, showed rapid and marked disruption of the ability to judge time, with a significant decrement apparent after 11 minutes exposure to 100 ppm.

Newer studies describe some of the previously unrecognized effects of low-level carbon monoxide exposure such as disturbance of coordination, judgment, psychomotor tasks, and visual acuity, and marked increases in choice discrimination errors and reaction time (D.E. Anderson, 1971). W. Bender and co-workers (1971) found that levels of carbon monoxide of 55 ppm and COHb levels of 7.2% resulted in a statistically significant diminution of visual perception, manual dexterity, ability to learn and perform certain intellectual tasks.

F. Silver (1976) suggests that impairment of some of the more delicate senses can be measured at even lower levels of COHb, such as 1 or 2%. This blood level can result from five to ten ppm in the breathed air. At 3 to 5% COHb, ordinary intellectual functioning starts to suffer in a way that can be measured. Creativity and finer intellectual coordinátion may be harmed at much lower levels, according to Silver. It is difficult to measure and document such low levels of impairment to intellectual functioning, coordination and creativity, which may account for some studies which claim to report "no effect" after heavy carbon monoxide exposure.

c. Mercury can damage the central nervous system and give rise to learning disabilities in children

Many researchers have found a correlation between mental retardation and learning disabilities and mercury. It accumulates in certain areas of the brain, eventually reaching concentrations that damage neural elements. High level exposures can produce excessive salivation, gross tremor and serious mental disturbance. C.C. Pfeiffer (1975) describes one instance of mercury poisoning in a family that ate pork from hogs that had been fed grain contaminated with a mercury-containing antifungal agent. Within two weeks, three of the family of ten were stricken with a derangement of the brain and spinal cord. One went into an eight-month coma resulting in total blindness, one went into a coma for four months, and the third developed difficulty walking and talking.

A Clinician's Guide to Toxic Metals (1979) lists the following as symptoms of elemental mercury vapour exposure: insomnia, loss of memory, lack of self-control, irritability, depression, tremors, and manic depression. Symptoms of organic mercury exposure are also described: forgetfulness, muscle weakness progressing to paralysis, hearing difficulty, loss of vision, speech disorders, incoordination, and general brain dysfunctions.

A.H. Corwin (1976) and B. Batts Young (1981) affirm the above effects of mercury poisoning. In fact, Batts Young reports that researchers investigating the effects of supposedly "safe" levels of mercury have found that a reliable prediction of certain memory problems could be based on a simple measurement of mercury exposure. Abstracts of these papers can be found in Appendix C.

d. Aluminum exposure may impair motor coordination

R.J. Boegman and L.A. Bates (1984) review the toxic effects of aluminum on the central nervous system. They describe how aluminum is deposited in the gray matter of the brain and affects many neuronal processes: it stimulates protein synthesis, inhibits axonal transport, and increases the breakdown, while decreasing the re-uptake, of neurotransmitters. Behavioural consequences may include memory loss, impaired motor coordination, decreased learning ability, psychotic reactions, and seizures.

e. Diesel exhaust can act as a behavioural modifier

In addition to the effects mentioned in the Section 2.1.2, there is some evidence that diesel exhaust can act as a behavioural modifier. R.D. Laurie, W.K. Boyes and T. Wessendarp (1980) conducted several experiments examining the effects of diesel exhaust on the behaviour of rats. The spontaneous locomotor activity (SLA), measured in standard running wheel cages, of adult rats exposed for 8 hours per day, 7 days per week was significantly less than that of controls. Experiments involving diesel exhaust exposure to neonatal rats indicated that adult rats, exposed to diesel exhaust during their neonatal lives, were significantly less active as measured by SLA. Adult rats, exposed to 20 hours of diesel per day as neonates, were placed in Skinner boxes after the SLA experiment described above had been completed. The exhaust exposed animals showed significantly decreased performance in a food-reinforced bar-pressing task. The results of the neonatal diesel exhaust experiments also support the hypothesis that diesel exhaust exposure during development of an organism can lead to behavioural differences in adulthood.

f. Methanol can cause both physical symptoms and behaviour changes

Methanol has been found to cause changes to the central nervous system. D.M. Halton (1983) describes how central nervous system depression as a result of methanol exposure may cause narcotic-like reactions. This may result in rapid changes in mood and can be accompanied by dizziness, headache, shortness of breath and altered visual perception which makes coordinated movement difficult. Methanol is also a slight irritant to the eyes and respiratory tract.

B.L. Carson and co-workers (1981) reviewed 25 documents related to exposure to methanol by inhalation in an attempt to set a safe dose for exposure to methanol resulting from automotive emissions. The results of acute, repeated dose, and chronic testing of animals and humans demonstrate the negative central nervous system effects of exposure to methanol. Changes that were reported in the nervous systems of some animals occurred at relatively low doses. Also found were incidences of light sensitivity and other degenerative visual effects, recurrent headaches and respiratory effects.

P. Pryor and S.J. Reno (1981) studied methanol exposure in an Aurora, Colorado school for the National Institute for Occupational Safety and Health (NIOSH). Symptoms included vision blurring, headaches, burning of the nose, sluggishness, dizziness, sore throat, dermatitis, chest tightness, and depression. H. Henzi (1984) presents the details of two cases of chronic methanol poisoning. Both patients initially developed clinical symptoms of multiple sclerosis: visual disturbances, tremor; reduced abdominal reflexes, impaired coordination and difficulties with walking. After the exposure to methanol had ceased, the multiple sclerosis symptoms persisted in one patient but disappeared gradually in the other. Henzi advances the theory that under certain circumstances multiple sclerosis is induced by formaldehyde stemming from the metabolism of methanol.

g. Some pesticides can have neurotoxic effects

Some pesticides can cause paralysis, anxiety, hallucinations, confusion, memory lapses, and other neurological damage in humans. K.A. Johnson and B. Batts Young (1982) describe the symptoms experienced by workers producing the pesticide Phosvel. They exhibited wide-eyed stares and giddy, inappropriate laughter as well as lethargy and leg paralysis. W. Mueller (1985) states that pesticides can cause death and affect people with blurred vision, mental depression, and confusion. T. Ginnetti and R. Olmstead (1984) describe the following symptoms relative to pesticide exposure: headaches, dizziness, fainting, blurred vision, shortness of breath and nausea.

W.J. Rea and co-workers (1984) describe serious psychological profiles associated with environmentally sensitive patients who had been exposed to chlorinated hydrocarbon pesticides. They discovered that treating these people with a rigidly controlled, chemically clean environment resulted in marked improvement on brain-function/psychological tests. According to C.F. Mactutus and H.A. Tilson (1984), exposure to chlordecone, a chlorinated hydrocarbon insecticide, produces a toxicological profile in adult humans characterized by neurologic signs and symptoms of tremor, irritability and hyper-responsiveness, weight loss and memory impairment.

Organo-phosphorus esters are also widely used as pesticides, having replaced many of the more persistent chlorinated hydrocarbon insecticides. Most organo-phosphates produce acute toxic effects, according to T. Damstra (1978). She describes the central nervous system symptoms of organo-phosphate intoxication as convulsions, speech disorders, insomnia, drowsiness, coma, anxiety, irritability, depression, impaired memory, and personality disorders. After recovery from acute poisoning, certain central nervous system effects, such as impaired memory and depression may persist for weeks or months.

h. Many other substances can be damaging to the learning process

Researchers suggest that many other substances also have behavioural and learning effects. (Further comment is also provided in Section 2.5 regarding the gaps in research in the area of neurobehavioural effects. Few compounds that are routinely encountered in most indoor environments have been evaluated for possible effects on behaviour and performance.)

Sulphur dioxide has been shown to influence hyperactivity. D.E. McLaughlin and H.P. Kagen (1974) conducted an investigation designed to ascertain the effects of chronic exposure to sulphur dioxide on learning in animals. They found that the animals' activity increased as the sulphur dioxide concentrations increased, indicating a hyperactivity reaction to elevated doses of sulphur dioxide. In addition, the learning ability of the animals decreased when the number of trials was increased in the presence of sulphur dioxide.

F. Silver (1976) feels that vinyl and other plastics may cause misbehaviour and learning difficulties. He has observed that many people experience burning sensations, loss of attention, and drowsiness when sitting on plastic chairs. He speculates on the possibility that incidences of misbehaviour by children such as wrecking school buses, hyperactivity and learning difficulties may all be influenced by exposure to tri-cresyl phosphate in the vinyl seating of the buses, school seats or cleaning agents. J. Makower (1981) describes benzene, a substance used in plastics as well as a variety of synthetic fibres and solvents, as having a negative effect on the central nervous system, causing drowsiness and loss of concentration.

Formaldehyde has been shown to have an effect on behaviour and performance. A.G. Ulsamer amd co-workers (1982) report such formaldehyde-related symptoms as irritability, lethargy, crying without a cause, and paranoia. S.A. Rogers (1985) has found that formaldehyde exposure can cause lethargy, depression, dopiness, violent mood swings, and confusion or disorientation.

R.W. Thatcher and co-workers (1982), conducted a study of heavy metal content of hair in over one hundred school children. They suggest that although the relation of hair cadmium to concentrations of brain cadmium is presently unknown, their test results are significant enough to indicate that chronic cadmium exposure can negatively effect verbal IQ.

2.2 How are Students and Staff Exposed to Pollution?

Study after study has shown that air inside homes, schools and office buildings can be laden with a variety of chemicals, gases, smoke, bacteria and other pollutants - sometimes in concentrations high enough to pose serious threats to health for at least part of the population (B.M. Small, 1983).

Aside from encountering pollutants at home and on the way to and from school, students and staff can be exposed to pollutants during the school day from numerous sources both within a school and from the neighbouring community. The following section explores a number of ways in which pollutants become part of the air inside a school.

2.2.1 Pollutants May Enter the Building from the Outside

In urban industrial areas, outdoor pollutants can enter school buildings through air intakes and be circulated throughout the school via the ventilation system. L.D. Pengelly and co-workers (1982) discovered the potential for this when they carried out some preliminary analyses of indoor and outdoor air pollution levels in twelve Hamilton, Ontario schools. They studied the results of sulphur dioxide, nitrogen dioxide and particulate measurement. They found that newer schools which have positive ventilation systems draw in polluted air from the outside and had indoor levels of nitrogen dioxide that were significantly correlated with outdoor levels. This was not true for old schools which often do not have methods for providing for ventilation aside from opening windows.

a. increasing ventilation may flush out indoor contaminants but can introduce urban pollution from outdoors

This sheds new light on the complicated problem of providing ventilation in schools. It is always important to provide sufficient ventilation to reduce indoor contamination to levels that will not cause problems for the occupants. But attempts to rid a school of indoor contaminants will introduce outdoor contaminants.

When outdoor contaminant levels temporarily increase at specific times during the day (e.g. during rush hour peaks), indoor levels of the outdoor contaminants can be kept from rising, for a while, by restricting ventilation. (There is a time lag between the levels achieved outside and those inside, because the outdoor pollutants seep in and replace the previous air slowly when ventilation is reduced).

But if there are significant inside pollutant sources, restricting ventilation even temporarily will cause a buildup of pollution inside, which may have worse effects than the traffic peaks outside. In buildings with fewer inside sources, more advantage can be taken of the time lag effect, and ventilation can be adjusted upward and downward to yield a lower exposure to outdoor urban pollutants than would be the case if a person stayed outside all day.

A. Dravnieks and J. Whitfield (1971) studied the components of air samples in three Chicago area schools by means of organic vapour collection devices and sample transfer analysis techniques. Sensory odour evaluations combined with the use of a gas chromatograph were also used. It was found that outside air quality was a major factor in odour and air quality in the schools, with outdoor pollutants entering through air intakes and passing through filtering units. One school had a plenum heating system, while the other two had individual heating or air conditioning units in each room. Frequently, the data demonstrated the presence of contaminants at levels not sufficient to cause odours.

b. exhausts from nearby roadways can be a hazard to children

Components of automobile exhaust can be serious hazards to the health of children in schools near busy roadways. The Canadian Association for Children and Adults with Learning Disabilities (1984) feels that lead emissions from cars are one of the major causes of minimal brain dysfunction which affects an estimated 10% to 15% of our population. The study by T. Nagira and co-workers (1981) that was quoted in Section 2.1.2 showed that children in schools located along Japan's busiest highway have increasing rates of respiratory disorders due to the excessive levels of automobile exhaust, particularly concentrations of nitrogen dioxide.

W. Ott and P. Flachsbart (1982) did an extensive study of carbon monoxide measurements in downtown commercial settings in four California cities, using personal exposure monitoring instruments. The data indicate that most commercial settings do experience carbon monoxide concentrations above zero indoors, because it tends to seep into buildings from vehicular emissions outside. Levels measured in these locations were not usually found to be above 5 ppm and seldom were higher than the U.S. health-related ambient air quality standards for carbon monoxide (9 ppm eight-hour standard, and 35 ppm one-hour standard).

Levels of carbon monoxide can be dangerously high in situations where the gas can seep into buildings from engine exhaust generated nearby or in attached garages. Ott and Flachsbart found that indoor garages and buildings with attached indoor parking areas differed from other commercial buildings in that they experienced relatively high carbon monoxide concentrations. Typical garage concentrations ranged from 15 to 40 ppm.

c. Some children come in contact with pollutants in the schoolyard

Children actively at play outside a school may be more affected by automobile exhaust than those who are more sedentary. H. Daniell (1976) has found that breathing air containing 50 ppm of carbon monoxide at rest causes the concentration in the bloodstream to rise to 5% in five hours. But during vigorous exercise, this level of air pollution can produce a level of 5% in less than one hour, limiting oxygen transport to muscle tissue by 5%. Daniell also states that carbon monoxide, in concentrations commonly encountered from automobile exhaust, interferes with endurance performance for many hours after exposure to the gas has ended.

In areas where schools are located near factories, children playing outside the schools may also be exposed to industrial pollutants, both in the air and in settled dusts and in urban soils, which are of special interest from the standpoint of child health. R.L. Solomon and D.F.S. Natusch (1977) conducted a field survey of soils and settled dusts in the small urban area of Champaign-Urbana, Illinois and found that they contained relatively high levels of heavy metals that could have a significant effect on human health.

E.C. Crosby and V.K. Argento (1982) evaluated concentrations of lead at elementary school playgrounds, parks, and day-care centres located near secondary lead smelting operations. The US Environmental Protection Agency-sponsored project examined locations in areas downwind for the prevailing wind directions and a reference area away from known industrial lead use operations but similar in traffic density and socio-economic structure. It was found that the soil, 28-day dustfall and window sill and refrigerator dust wipe samples in the area surrounding the lead smelter contained significant levels of lead concentrations.

Similar conditions are being investigated in several Toronto areas by the Toronto Department of Public Health. Further discussion can be found in Section 3.3 "Specific Toronto Issues".

As well as being exposed to gases and dusts from urban air pollution, children's health can be at risk from exposure to other hazards on the playground. S. Dreistadt issues a warning that wooden playground equipment may be treated with dangerous preservatives, exposing children to a serious health hazard from small amounts of the chemicals. He reports that the city of Berkeley, California has found that sealers can reduce arsenic levels in such equipment one hundred-fold. Pentachlorophenol, chromated copper arsenates and ammoniacal copper arsenate are common preservatives for green wood used in buildings as well as playground equipment. M. Smolen (1984), in an article about building a house with this type of treated wood, presents a caution to avoid contact by children and pets due to recent U.S. government concerns about health hazards connected with its use.

In some areas, phenoxy herbicides are sprayed on school or adjacent properties for weed control. There have been reports from parents that children playing in schoolyards have been poisoned by these chemicals (Waterloo Public Interest Research Group, 1979).

2.2.2 Many Pollutants Originate Inside School Buildings

Although official efforts to control air pollution have traditionally focused on outdoor air, it is now apparent that elevated contaminant concentrations are common inside many private and public buildings. J.D. Spengler and K. Sexton (1983) state that concerns about potential public health problems due to indoor air pollution are based on evidence that:

1. urban residents typically spend more than 90 percent of their time indoors
2. concentrations of some contaminants are higher indoors than outdoors, and
3. outdoor pollutant measurements do not adequately characterize true personal pollutant exposure

C.S. Dudney and P.J. Walsh (1981) estimate that indoor exposure may constitute 80-95% of the total exposure for some pollutants.

a. reducing ventilation to save energy may allow indoor pollutant concentrations to build up

J.V. Berk and co-workers (1980) describe how some energy conservation measures increase the levels of indoor pollutants. In an effort to decrease the amount of energy required for heating and cooling, many newer buildings have been sealed to reduce the rate of exchange between indoor and outdoor air. Reduced air exchange can lead to increased indoor levels of some pollutants. Because of this, the World Health Organization has warned that indoor air may become increasingly damaging to health.

In some buildings, the sealed environments are combined with inadequate ventilation systems, which recirculate a wide variety of substances which may adversely affect health (A. Pappert, 1984). Indoor air pollution problems in schools usually are the sum of many small sources. They can vary widely from building to building and are relative to the particular sensitivities of individuals within each building.

Among the variety of indoor contaminants and contaminant sources in school buildings are tobacco smoke, pesticides, art materials, office materials, formaldehyde in science labs and building materials, paints, cleaning materials, dust, methanol from copiers, asbestos fibres, and micro-organisms. The air supply systems themselves, at least during initial heating periods, can also contribute additional organic vapours and sometimes odours (A. Dravnieks and J. Whitfield, 1971). (A more complete list tabulated from letters and presentations made by teachers and parents in the Toronto school system has been provided in Section 3.2).

As a result of studies of several buildings that were conducted because of complaints about air quality, J.L. Sullivan stresses the increased importance of building ventilation in light of the trend toward sealing of buildings for energy conservation. T. Godish (1984) describes how pollutants are trapped within sealed buildings and recirculated by means of air handling systems. Characteristically, a large number of individuals can be affected under such circumstances, in some cases 30-40% of the building's occupants, according to Godish.

M. Bee (1981) reports that the closed ventilation system at a San Francisco high school, combined with low levels of airborne chemicals in synthetic materials used in the building's construction, is likely causing the health problems experienced by students and teachers. This is the opinion of a toxicology committee of faculty which was formed to investigate the possible health hazards of the building.

A team from the Occupational Health Clinic at San Francisco General Hospital was also formed to administer a health questionnaire to students and staff at the same school, who had complained of burning eyes and noses, sore throats, stomach pains, persistant headaches, fatigue, weakness, and difficulty concentrating after the start of school in the Fall of 1980. The symptoms steadily worsened and only occurred during attendance at the school, a modern campus designed to be air-tight and energy-efficient.

B. Berglund, I. Johansson and T. Lindvall (1982) feel that recirculation of air, especially in new buildings, should be carefully controlled. They studied the air quality in a newly built preschool in Stockholm, Sweden after staff and students in about 100 similar schools reported medical symptoms that are associated with bad air quality, such as dry throat, eye irritation, lip irritation, hoarseness, hacking cough and itching.

Typical air contaminants emanating from the building materials were determined, their variation over time (0-18 months) was measured, and the influence of the ventilation system on contaminant concentrations was studied. The study shows that all the organic compounds decline in concentration mainly within the first 6 months of occupancy. The researchers conclude that a new building needs to be gassed off during at least the first six months after its construction by allowing no recirculation of return air. Berglund and co-workers recommend that during at least one to two additional years, the recirculation rate of return air be generous, perhaps up to 50%.

Recirculation of air is known to spread disease organisms. E.C. Riley and co-workers (1978) report that organisms recirculated by the ventilating system were strongly implicated in at least one case during a measles epidemic in a modern suburban elementary school in upstate New York in the spring of 1974. The authors used a model which provides a basis for apportioning the chance of infection from classmates sharing the same home room, from airborne organisms recirculated by the ventilating system, and from exposure in school buses. The index case was a girl in second grade who produced 28 secondary cases in 14 different classrooms, or 93 units of airborne infection per minute. It is believed that the high percentage of air recirculated throughout the school accounts, to a large degree, for the extent and sharpness of the outbreak.

The results of environmental and medical surveys at a Michigan school are reported by K.E. Anderson (1983). Again, it was concluded that the complaints of irritant symptoms could be in part related to the building's heating, ventilating and air conditioning (HVAC) system. In September and October 1982, the National Institute for Occupational Safety and Health (NIOSH) studied the East Jackson Middle School in Jackson, Michigan, on the request of the school's teachers. An estimated 90% or more of staff members had reported a variety of irritating symptoms, including headache, fatigue, mucous membrane irritation of the eyes, nose and throat, and skin irritation. No evidence was found of any undue chemical contamination in the school and carbon dioxide levels were within normal ranges. A number of recommendations were made to correct inadequacies in the school's ventilation system and for daily inspection of the rooftop HVAC units.

Often, unpleasant and/or stale odours are reported to be creating unacceptable conditions in schools. R.A. Young and co-workers (1981) assessed indoor air quality at Oakland Gardens Elementary School in New York City under three different ventilation rates. When the ventilation rate was reduced, carbon dioxide concentrations increased significantly, but did not exceed current occupational standards. At the low ventilation rate, odour acceptability decreased and in one of the classrooms the odours were judged unacceptable according to current ASHRAE standards.

N. Hijazi and co-workers (1983) stress that a building's ventilation system can meet the accepted ventilation standards and that no contaminants may be detected near accepted threshold limits, yet complaints of inadequate indoor air quality may continue to be heard. According to the authors, this can in part be attributed to the fact that there is uncertainty over the amount of ventilation required to maintain an acceptable working environment. In addition, many contaminants can be odorous or irritating at concentrations far below their Threshold Limit Values, and can therefore cause complaints at concentrations which may be too low even to be detected during a conventional sampling program.

J.L. Repace (1983) also feels that current ventilation standards are often inadequate. For instance, he gives an estimate of the variation of nonsmokers' lung cancer risk from passive or involuntary smoking, as a function of ventilation rate in a typical office, at an occupancy of 7 persons/100 m^2 (per 1000 ft^2) as specified under ASHRAE Standard 62-1981, Ventilation For Acceptable Indoor Air Quality. Repace says that, assuming one third of the office workers are smokers who smoke at the average rate of two cigarettes per hour, the nonsmoking office workers exposed to environmental tobacco smoke for a 40-year period under the ventilation rate recommended by the standard would be subject to an estimated lifetime involuntary risk that is 250 times the maximum lifetime value considered acceptable under commonly used environmental criteria for carcinogenic contaminants in air, water or food.

In an effort to ascertain optimum rates of air supply applicable to schools, B.Z. Voronova and E.A. Elkovskaya (1980) conducted experiments in which an appreciable improvement in air quality occurred when the rate of air supply was increased to 40 or more cubic metres per hour per child. However, the functional state of the children improved only when the air supply was increased to at least 60 cubic metres per hour per child. The functioning of different bodily systems did not improve simultaneously. The first to improve were the respiratory and cardiovascular functions, followed by central nervous system functions.

b. Fumes and dust from renovation in schools can cause illness

Both the process and the result of renovations to school buildings can create a variety of substances that can negatively affect many people. Construction dust and fumes from paints, solvents and adhesives can be harmful. Fumes from many newly-installed materials, such as synthetic carpets, drapes, varnished surfaces, and particleboard partitions and furniture can also cause irritation for many and severe health problems for some.

Fumes from interior painting during school hours can cause symptoms of fainting, headache and nausea in many people if ventilation is insufficient. N. Hijazi and co-workers (1983), in a listing of harmful chemicals in indoor air, include xylene which is given off by some paints. Xylene is an irritant and central nervous system depressant.

The Toronto Board of Education (1982) Chemical Data Sheets caution against prolonged breathing of vapour from interior high gloss enamel paint. Symptoms of over-exposure to fumes are listed as headache, nausea and dizziness. Health effects from exposure to concentrations of fumes from alkyd semi-gloss paint are listed as anaesthesia, headache, nausea, dizziness, central nervous system depression. Paleness and muscle weakness, respiratory irritation, headache, drowsiness, intoxication, anemia, and nausea are also listed as symptoms of over-exposure to floor lacquers.

Inhalation of fumes from wood stains is said to have the potential to cause respiratory irritation and act as a central nervous system anaesthetic, resulting in loss of coordination. H. Daniell (1976) also describes how methylene chloride from paint and varnish removers can have an effect on people similar to that of inhaling carbon monoxide.

J. Carey (1985) reports that students in a California high school suffered from headache, sore throat and fatigue from formaldehyde at

1.45 ppm coming from new particleboard shelves in the school library. S.A. Rogers (1985) presents case studies of a student exposed to formaldehyde from new carpets and panelling as well as a teacher exposed to formaldehyde from building materials used in school renovations. After renovations to the building, the teacher experienced symptoms that came on quicker and more severely with each entry into the school. She gradually lost her voice, and experienced tender, swollen neck glands and exhaustion. A formaldehyde blood test showed 10 mcg/ml after a day at school and 6 mcg/ml after a weekend at home. A.G. Ulsamer and co-workers (1982) report that the U.S. Consumer Product Safety Commission has received over 3,000 complaints involving consumer exposure to formaldehyde vapour released from building materials.

J.H. Olsen and M. Dossing (1982) performed a questionnaire study among 70 employees at seven mobile day care centers where urea formaldehyde glued particleboard has been used for indoor panelling and among 34 employees at three control institutions selected at random where no particleboard has been used. Responses showed a significantly higher frequency of the following symptoms among the staff at the mobile institutions: mucous membrane irritation, headache, abnormal tiredness, menstrual irregularities and use of analgesics. The median concentration of formaldehyde in the mobile institutions was 0.43 mg/m^3 in contrast to a concentration in the control institutions of about 0.08 mg/m^3.

c. chemicals used for pest control can severely affect some people

Pesticides are highly toxic substances that can cause extreme discomfort and symptoms of ill health upon exposure to excessive concentrations of their residues indoors. The literature reviewed contained few incidents that related specifically to pesticides in schools, but those that were found may give an indication of the kinds of effects that can occur.

T. Ginnetti and R. Olmstead (1984) relate how 25 students in an Illinois high school were taken to a hospital after being exposed to a roach-killing pesticide spread around a swimming pool and hallways. Headaches, dizziness, fainting, blurred vision, shortness of breath and nausea were the symptoms experienced by the students. The school had been sprayed when it was closed on a Monday holiday with a pesticide of which the active ingredient is Baygon. The manufacturer and Illinois Environmental Protection Agency blamed the ill effects on fumes from the petroleum distillate solvent in which the pesticide is dissolved.

Referring to the use of the pesticide diazinon, the Toronto Board of Education (1982) Chemical Data Sheets caution that spray mist should not be breathed and contact with skin should be avoided. Symptoms of inhalation overexposure are: difficulty breathing, twitching, nausea, irritation, narcosis, headache, blurred vision, dizziness, staggering, loss of reflexes, salivation, constricted pupils, collapse and coma. This substance was banned for use in schools by the Toronto Board in 1983.

d. Cleaning products contain many materials that can be irritating

The Toronto Board of Education (1982) Chemical Data Sheets list a wide variety of cleaning materials used in school buildings. Some give off irritating fumes, and when used without adequate ventilation, can create respiratory irritation for most people and other health problems for susceptible people. Many cleaning products contain ammonia which can be extremely irritating to the nose and throat. Furniture polishes contain sizeable levels of petroleum distillates and the Chemical Data Sheets list euphoria, intoxication, headache, tinnitis and nausea as symptoms of exposure to concentrated fumes. Sensitive individuals can also experience skin irritation upon direct contact with recently polished surfaces.

e. art materials are notorious as potential hazards

Commercial inks and papers as well as various types of school supplies and art supplies such as paints, solvents, marker pens and craft materials can give off immunotoxic fumes and cause reactions in susceptible individuals (D.L. Dadd and A.S. Levin, 1982). H. Steffens (1984) describes art rooms as being the most polluted areas within school buildings. Steffens writes that some art supplies, including those designed for young children, contain substances that can cause cancer or damage to the reproductive, nervous, and respiratory systems, the heart, and other vital organs. The potential danger of these materials can be compounded if those who are exposed are already especially vulnerable to pollutants (e.g. children and people with health problems (J. Harrison 1983).

Aerosol spray paints and lacquers of the type often used in classrooms can be especially hazardous to health, with the potential for causing nausea, dizziness, weakness, paleness and intoxication. Respiratory irritation is a common symptom, due to high concentrations of vapours and mist (Toronto Board of Education Chemical Data Sheets, 1982).

The Chemical Data Sheets note that rubber cement fumes are hazardous and the product should only be used under good ventilation conditions. Rubber cement compounds contain high levels of toluene and inhalation overexposure can produce central nervous system depression, leading to loss of coordination, impaired judgement or stupor.

Tempera paints, commonly used in elementary classrooms, have not been found to cause major ill effects or health hazards, but it is recognized that overexposure to them can cause mild, short term discomfort (Toronto Board of Education, 1982). The common practice of leaving prepared paint sitting in open containers in the classroom can contribute to overall levels of local pollution and may create discomfort for some susceptible individuals.

Some legislators feel that art supplies being used in many public school systems contain toxic substances that pose potential health and safety hazards, according to a report released by a division of the California Public Interest Research Group (CalPIRG). J. Thornton reports that two pieces of legislation before the California state governor would require that school art supplies be labelled as to content and that those supplies considered hazardous be kept out of the hands of kindergarten and elementary pupils. Another report tells how a paint-filled marker pen containing a toxic chemical which school children were sniffing has been voluntarily recalled from Texas stores because it was not properly labelled (Citizen Patriot, 1984).

Visual Arts Ontario (1981) hosted a conference designed to communicate the hazardous effects that certain commonly used art supplies can have and the precautions that should be exercised. The group claims that artists are among the highest sufferers of cancer, and are prone to other diseases due to use of solvents, heavy metals, mineral dusts, gases, and other hazardous chemicals such as acids and alkalis. It is stressed that adequate ventilation, proper use of protective equipment and basic safety equipment must become the concerns of art educators. In addition, the group suggests that elementary, secondary and post secondary institutions should incorporate into their curriculum health and safety programmes regarding the use of art materials.

f. office supplies can contain hidden hazards

Many office supplies and processes used in schools can create health hazards and cause susceptible people to experience negative reactions. Various types of papers, inks, and reproduction processes have been found to be a problem. Liquid eraser products contain trichloroethylene and tetrachloroethylene, which are suspected carcinogens (K. Nussbaum, 1981). The Toronto Board of Education (1982) Chemical Data Sheets list nausea and anaesthesia as symptoms of inhalation overexposure for one brand of liquid eraser and suggest that it be used under local exhaust ventilation.

J.G. Marks (1981) documents cases of allergic contact dermatitis to carbonless copy paper such as is sometimes used for report cards. In this case, the offending agent proved to a coating on the paper—a colour-forming chemical composed of paratoluene sulfinate of Michler's hydrol (PTSMH) which apparently has a low sensitizing capacity. J.G. Marks Jr. and co-workers (1984) describe a 27-year-old woman who experienced pruritus, eye and throat irritation, hoarseness, shortness of breath, and fatigue within half an hour of exposure to carbonless copy paper. On two separate occasions, she was purposely challenged in a controlled-blinded fashion with portions of the carbonless copy paper. This resulted on both occasions in contact urticaria of the hand that held the paper and changes in pulmonary function flow-volume loops characteristic of upper airway obstruction. It was concluded that the cutaneous and respiratory symptoms induced by the carbonless copy paper were probably related to prostaglandin release.

g. Methanol copiers can have serious effects

A number of studies have indicated the potential for methanol overexposure from the use of spirit duplicating machines in enclosed spaces (D.M. Halton, 1983). P. Pryor and S.J. Reno (1981) describe a situation in a Colorado school where teacher aides were experiencing adverse health effects from exposure to methanol during the use of spirit duplicators. NIOSH, the agency that investigated the exposure, reported that a hazard existed not only to those operating the duplicator, but also to those persons in the room at the time of operation of the duplicators. Legal suits are being filed in the United States over a methanol copier that spewed dangerous fumes into a teacher's work area in Jackson, Michigan. M. Guilfoil (1984) reports that the person became highly sensitized to printed materials and other environmental chemicals following the exposure.

A recent Provincial directive ordered school boards in Ontario to replace their old hand-cranked spirit duplicators, or ensure that the procedure for using them was in line with Ministry of Labour standards. This move was reported to be in reaction to reports from the United States of sickness and injury caused by use of these copiers (Toronto Star, 1985).

h. school science laboratories may contain many toxic materials

E.L. Rieber (1984) conducted research on mercury vapour in science labs and its potential harmful effect on the health of children. Rieber concluded that science laboratories can, indeed, be hazardous places since there are no provincial regulations with respect to safety standards for secondary school science labs, and no systematic monitoring of safety conditions exists at any level.

Chemicals used in school laboratories are often not vented adequately because of the difficulties in providing adequate fume protection for large groups of people performing simultaneous experiments. Students and staff are thereby exposed to higher doses than are necessary or advisable. For example, the use of formaldehyde in biological experiments and dissections has been reported to be a hazard for some people. (Readers are referred to prior sections on the hazards of formaldehyde, and indexed references to formaldehyde in the briefs and presentations from teachers and parents in Appendices A and B).

Sometimes, malfunctioning equipment or improper use can create a hazard. S.A. Rogers (1985) describes how a student's chemical sensitivity was precipitated by leaking gas jets in a high school science lab, in addition to a number of other chemical exposures.

i. dust can be a problem for many people with allergies

Many people experience negative allergic reactions to common house dust. N. Croft (1984) and A.V. Zamm and R. Gannon (1980) all describe dust as one of the many environmental problems within buildings that can cause allergies, asthma and other respiratory problems.

I. Andersen and co-workers (1979) studied nasal mucous flow, airway resistance, and subjective response in sixteen young healthy subjects during five hour exposures to 2, 10, and 25 mg of inert dust per cubic metre in an environmental chamber. At all dust concentrations tested there was a decrease in one-second forced expiratory volume, but not in the forced vital capacity or the forced expiratory flow during the middle half of the forced vital capacity. The nasal penetration fraction of particles was approximately 55 percent for the smallest particles (less than 1.8 micrometres) and 20 percent for the largest (greater than 12.5 micrometres). Discomfort was proportional to the concentration of dust, but lagged almost two hours behind the changes in dust concentration. The main complaints were dryness in the nose and pharynx.

What constitutes indoor dust is also important. I.B. Millar and P.A. Cooney (1982) found lead in indoor dust that they attributed to an arterial highway carrying about 35,000 vehicles per day. B. Seifert, M. Drews and K. Aurand (1984) have developed a simple method in which building dust collected with a passive sampler is used for a rapid screening of the heavy metal content of dust deposited in buildings located near a pollutant source. With it they measured the concentration of heavy metals in deposited indoor dust and found the process a good means of characterizing the exposure of people living and working close to emission sources of lead and cadmium.

It was apparent from the briefs and letters from teachers during the course of this study that many people also experience negative irritant reactions to chalk dust in the classroom setting. In a paper prepared for the annual Congress of the American College of Allergists, Dr. Leonard Caputo, an allergist from Mobile, Alabama, cites chalk dust as one of the major allergenic and irritating materials to which students and school staff are exposed (Chicago Sun Times, 1981).

j. smoking in schools poses a serious problem for many people

Tobacco smoke is a major indoor air pollutant that creates discomfort for many nonsmokers and serious health effects for those sensitive to it. Concentrations of tobacco smoke are, of course, greatest near the source and in enclosed spaces. But amounts great enough to be a hazard for sensitive people can occur throughout a building due to circulation of the polluted air by means of ventilation systems.

J.L. Repace (1983) writes that nonsmokers differ in their sensitivity to tobacco smoke, with those who suffer allergic disease being most likely to exhibit acute debilitating sensitivity. Sensitivity to tobacco smoke may produce itching, tearing, burning, or swelling of the eyes; sneezing, or blocking, running, itching or dryness of nasal airways; headache, coughing, wheezing, sore throat, hoarseness, nausea or dizziness.

According to Repace, hypersensitive nonsmokers report particular increases in the frequency of nose and throat irritation, and in wheezing, relative to nonallergic nonsmokers. He cites a Gallup Poll taken in 1978 that found that about four percent of nonsmoking respondents professed allergy to tobacco smoke. Thus, an estimated four percent of the nonsmoking population appears to be hypersensitive to ambient tobacco smoke.

Studies by J.L. Repace and A.H. Lowrey (1983) indicate that, on the average, the workplace is a more important source of exposure to tobacco smoke than the home environment. They have shown that for nonsmokers the ratio of workplace dose of tobacco smoke to the exposure received at home is nearly 4:1. By modelling the exposure of the nonsmoking U.S. population to the particulate phase of tobacco smoke from indoor air pollution in buildings, the authors estimated that the average U.S. nonsmoker of working age receives an exposure of 1.4 mg per day, a weighted average taken over exposures encountered both at home and at work.

In consideration of this danger of heavy workplace exposure to tobacco smoke, a Boeing of Canada Ltd. plant in Winnipeg banned smoking on its premises, citing too much lost production time and damage to the health of the workers as the reason. About 60% of the staff are smokers. The scheme was announced after the parent company in Seattle, Washington launched a similar plan (Toronto Star, 1984).

The Medical Officer of Health for the City of Toronto has suggested that all smoking should be banned in Toronto schools.

2.3 What Other Things Affect Education in a Similar Way?

In addition to the pollutants described above, there are many other stresses that can have similar negative effects on children and adults in the school setting. Nutritional deficiencies, food allergies, noise pollution, psychological stresses, and such things as inappropriate lighting may result in discomfort, health problems, undesirable behaviour, or learning difficulties in some people. In many instances of illness or learning problems related to an individual's immediate environment, some or all of these factors may be present, in addition to effects from pollution. Attempts to create an optimum learning environment may therefore need to encompass many such factors at once.

a. nutrition can have a demonstrable effect on learning ability

An increasing number of scientists and physicians are now concluding that, in many children, learning disabilities may, in part, be the result of nutritional deficiencies (L. Gilka, 1978).

A. Schauss (1980) describes how junk food diets, sugar starvation, and vitamin deficiencies, can help convert a normal brain into an abnormal or even criminal mind. C. Fredericks (1976) found in his practice that nutritional deficiencies caused hypoglycemia and allergies to food and that environmental pollutants produced symptoms of hyperactivity, paranoia, neuroses, and other psychological disturbances. He feels that these problems can be alleviated by treating their biological causes. M. Colgan (1982) feels that simple changes in nutrition can help many learning disabled children.

J.F. Wallace and M.J. Wallace (1978) feel that excessive refined sugar intake is often an important factor in behavioural problems, fatigue, learning deficiencies, hyperactivity, juvenile delinquency, and violence. They conducted a study of refined sugar consumption by children and concluded that the degree of sugar consumption is an accurate indicator of nutritional inadequacy.

In addition to having a direct effect on learning ability and behaviour, nutritional status can substantially modify the severity of a reaction to a particular substance. K.R. Mahaffey and J.E. Vanderveen (1979) established by means of investigations with experimental animals and epidemiological observations on humans, that nutrition plays a role in altering susceptibility to a variety of pollutants. They found that the degree of nutritional deficiency necessary to change an individual's dose-response to a toxic compound need not be severe. E.J. Calabrese (1978b) describes in some detail the complex effects of nutrition on susceptibility, and stresses that different nutritional factors can enhance or reduce a person's vulnerability to pollutants.

Studies are presently underway at the Alberta Children's Hospital on the effect of all aspects of diet (allergy, intolerance, dietary deficiencies and environmental sensitivity) on the behaviour, physical symptoms, and sleep patterns of children. (Further reference to this work and to guidelines established by the hospital's Department of Dietetics are described in Appendix B. The particular paragraphs referring to this are indexed under 'Alberta' in the subject index.)

b. food allergy may be involved in a variety of behaviour problems

Many types of poor school behaviour, from hyperactivity, irritability, violence, fatigue, and restlessness, to poor academic performance, can be caused by food and chemical allergies. In many cases, the nervous system is totally incapable of functioning normally because it is under allergic distress. The child who reads well once in a while and poorly at other times, the child whose writing is poor one day and fine the next, the child who can sit still in the morning, but is impossible to control in the afternoon - any or all of these children may be demonstrating cerebral allergy (M. Mandell and L. Waller Scanlon, 1979).

Clinical records indicate that there is a definite relationship in some children between food allergies and behaviour which can be helped by diet modification (D. Rapp, 1979). According to Dr. Rapp, such things as easy distractibility, impulsiveness, emotional problems, poor coordination, perception problems, learning problems related to reading and spelling and short attention span are included under the category "minimal brain dysfunction" and may be caused by food allergy.

F.J. Kittler and D.G. Baldwin (1970) found that allergy of the tension-fatigue syndrome classification is present in a significant percentage of children with minimal brain dysfunction and related learning disabilities. C. Fredericks (1976) feels that more serious psychological disturbances, such as paranoia, neuroses, and acute psychoses may also be caused by allergic reactions.

D.R. O'Banion, L.A Peek and J.R. Butler (1981) present a case history of a fifteen year old male adolescent with an extensive background of behaviour and learning disorders. This boy had undergone traditional psychological, educational, and medical treatments to no avail. A food testing program involving the ingestion of single organically grown or less chemically contaminated foods was established to ascertain relationships between specific foods and the individual's physical, educational, and behavioural irregularities. It was found that extreme aggression and hyperactivity each occurred within minutes after the ingestion of a specific food. The food related to the hyperactive state was tested a second time under more closely observed conditions, and resulted in a decrease in performance on a symbol-digit coding task and the occurrence of a number reversal on one of the coding forms when the reaction was in progress.

J.A. O'Shea and S.F. Porter (1981) tested and treated children, over a six-week period, by double-blind studies, to determine whether the hyperkinetic syndrome is due, in part, to certain foods, food colours, and inhalant allergens. Behaviour was monitored by parents, teachers, and a psychologist. Significant improvement was reported in 11 of 14 cases.

W.G. Crook (1978) has documented, by means of clinical records and questionnaires, all his patients with learning or behaviour problems and hyperactivity. He claims that in 70% of these patients a definite relationship of diet to hyperactivity could be observed, as determined by improvements of the symptoms on elimination of suspected foods, and flareup on challenge (with identification) of the specific foods causing the problem. The substances causing hyperactivity in the most children were: sugar, food additives such as colours (especially red), preservatives and flavorings, hot dogs, soft drinks, ice cream, milk, corn, chocolate, egg, wheat, and potato.

c. Some people are more affected by noise than others

High noise levels are increasingly being looked at by researchers as a health hazard that could create actual sickness and stress in some people (J. Fleishman, 1984). Excessive noise can have a negative effect on concentration and learning ability in some children.

K.B. Green and co-workers (1982) studied the effects of aircraft noise on reading levels of school children. The percent of students reading below grade level from 1972 to 1976 was regressed on racial, socioeconomic, educational, and noise level variables for all elementary schools in Brooklyn and Queens, New York. Schools were assigned noise exposure scores based on Noise Exposure Forecast contours for New York City airports. The results, adjusted for confounding factors, indicated that 3.6% of the students in the noisiest schools read at least 1 year below grade level. The dose-response relationship indicated that the percent reading below grade level increased as noise level increased.

K.B. Green and co-workers also studied the effect of aircraft noise on children's hearing and found a slight correlation between hearing loss and excessive noise. 201 cases with permanent bilateral high-frequency hearing loss and 208 controls with normal hearing were studied in New York City. Aircraft noise exposure was estimated for the residences of cases and controls from Noise Exposure Forecast contour maps of the New York City airports. The results showed a positive, although small, association between aircraft noise exposure and the risk of high-frequency hearing loss.

A. Moch-Sibony (1981) studied the general effects of prolonged exposure to noise on children by means of a field study undertaken in a zone highly exposed to aviation noise. A comparison made between a sound-proofed and a non sound-proofed school brought out the following facts: the children did not express any feeling of disturbances as to the frequency of airplane passage; yet, after prolonged exposure to the auditory stimulus, intellectual, psychomotor and personality changes were observed. Moch-Sibony speculates that the distraction created by excessive noise levels contributed to the problems experienced by the children.

d. Some people are bothered by different types of lighting

It appears likely that certain types of lighting, especially fluorescent light may have a negative effect on some people. Some people report fatigue and headache after working in a room with such lighting.

Recent research reported by W.E. Hathaway (1983) indicates that there are a great many non-visual effects of light on people, including the suntan effect, the control of rickets, synchronization of a number of physiological rhythms, and prevention or control of infantile jaundice. Other research indicates that variations in the quality of light can influence student achievement and behaviour. Closely related to light is colour and there are studies which indicate that colour too can produce measurable effects in the classroom.

Hathaway feels that this research is sufficiently conclusive to allow the suggestion that light and colour have predictable effects on students and that learning environments can be designed to foster beneficial effects of lighting.

J. Ott and co-workers (1973, 1976, 1982) conducted a study which showed effects of fluorescent lighting on hyperactive children. In two first-grade classrooms, the standard cool white fluorescent tubes and fixtures with solid plastic diffusers were left unchanged. (The plastic diffusers stops the transmission of any trace of long-wavelength ultraviolet.) In two other classrooms, the tubes were replaced with full-spectrum fluorescent tubes that more closely duplicated natural daylight, and the diffusers were left off.

By means of hidden time-lapse cameras, student behaviour was observed and recorded. Under the standard cool white lighting, some children demonstrated nervous fatigue, irritability, lapses of attention, and hyperactive behaviour. Within a week of the new lights being installed, a marked improvement in their behaviour appeared and overall classroom performance improved. Ott has also conducted experiments in which the effect of light and darkness on the pineal gland has been studied.

Ott noted a similarity between the hyperactive reaction that some children experience under fluorescent lights and the symptoms said to be triggered by artificial food flavours and colourings. Ott feels that in the case of the fluorescent light, it may be the low-frequency non-ionizing radiation emitted by the lights that negatively affects hyperactivity and learning disabilities.

L. Ingraham (1983) studied the effects of electromagnetic radiation emitted from fluorescent lights on the off-task behaviour of grade three school pupils. The independent variable was the level of electromagnetic radiation which was eliminated by grounding and shielding the fluorescent light fixtures in the experimental classroom. The off-task behaviours were recorded by a reliable on-sight observer for two groups of pupils. For the intact classroom group (comprised of all pupils and heterogeneous with respect to hyperactivity) the elimination of electromagnetic radiation decreased significantly the rate of off-task behaviours. For triad groups (groups of three pupils selected as being most "hyperactive") the results were mixed and inconclusive and further tests were suggested.

E. Wotton (1981), in a set of guidelines for quality of light produced for the Ontario Ministry of Education, discounts fluorescent lighting's possible effect on hyperactive children due to lack of conclusive data. But Wotton does suggest that students working under fluorescent lighting with very good colour rendering become less visually fatigued than those working under some other forms of fluorescent lighting. He also feels that the hum emitted by some fluorescent light ballasts can be distracting to some people.

K.E. MacLeod (1981) has shown that old and defective fluorescent light ballasts can emit PCBs and in some instances are an important source of indoor atmospheric contamination.

e. temperature and humidity are important health and comfort factors

Reports received from parents and teachers during the course of this study indicated that temperature and humidity are definitely factors they would like to see taken into consideration when designing an optimum learning environment. Others generally agree. In a study of indoor environment and how its affects schoolchildren's health, (K.K. Ibsen, O. Valbjorn and A. Nielsen, 1981), over 1200 pupils were given a questionnaire about their health and their perception of the environment. The majority of the students had complaints concerning heat and static electricity (from dry conditions).

Indoor temperatures that are too high can negatively affect comfort and learning. W. Bischof and L. Banhidi (1984) conducted a study to discover the optimal and permissible limit values of indoor temperatures associated with the mental performance of students. A variety of tests were performed over a two-week period utilizing eighteen children and differing tasks and room temperatures. It was found that test results were greatly influenced by temperature changes with a decrease in performance resulting from temperatures over 28 degrees C. The most favourable preconditions for mental performance were recorded in the temperature range between 18 and 22 degrees C.

F. Befekadu (1984) notes that sensation of warmth or cold is very subjective and depends upon various factors like the kind of activity in question, acclimatization, age, health condition, type of clothing, and so on. He stresses that conditions necessary for obtaining optimum comfort vary from one individual to another.

Levels of humidity in schools have been shown to have an effect on children's respiratory health. G.H. Green (1979) conducted a study in which school children were exposed to high and low levels of humidity. Increased winter relative humidity significantly decreased occurrences of respiratory illnesses. Increases of 8% to 10% in the 22% to 50% humidity range reduced the absenteeism from 10% for adults to 50% for kindergarten children.

f. psychological stresses may combine with physical stresses

I.R. Bell (1982) writes that a person's reaction to an overload of chemical exposures depends on the person's total stress load, including all of the psychosocial, physical, chemical, antigenic or infective stressors that impinge on the individual. W.H. Philpott and D.K. Kalita (1980) describe a group of 250 emotionally disturbed patients who developed major symptoms on exposure to their commonly consumed foods and frequently encountered chemicals. Symptoms included psychosis, schizophrenia, blurred vision, anxiety, dissociation, delusions, headaches, dizziness, inability to read or write, hyperactivity, and a whole range of gastro-intestinal problems.

Psychological stresses resulting from food and chemical sensitivities themselves may also increase the difficulty that children with such sensitivities are already experiencing in the school setting. D.R. O'Banion (1981) has found that many children who are food and chemically sensitive have trouble developing and then maintaining appropriate social and academic skills. He states that this leads to an increased probability of frustration and decreased attention span.

2.4 How Important is Pollution, Compared to Other Factors?

Many questions in education come down to economics. Society cannot afford to do everything, so how do we choose from among the many things we would like to do for the education of our children? How does pollution rank on the ladder of priorities? Can it wait another year or two until its turn comes up in the budget? Can those affected put up with a few more headaches without suffering permanent damage?

And when someone reports trouble they think is caused by environment, how important is pollution, compared to noise, lighting, heat and humidity? Where should we place our efforts and our money?

The answers are not provided in the literature, except indirectly. New information about individuals who are sensitive to many environmental factors provides the key. Each reacts uniquely to any given mix of environmental factors. If you place all your money on one factor, you may end up wrong most of the time. Each school, even each classroom, may have a different set of requirements. In one situation, lighting and windows may resolve problems; in another, ventilation and removal of pollutant sources may reduce complaints.

In those cases where pollution does prove to be a major factor in causing discomfort, illness, or learning effects, it is important to recognize that reduction of pollutant exposure may be a matter of absolute necessity. If a child is being poisoned, no amount of special education training or sunlight may compensate for it.

In addition, reduction of pollutant loads may be a matter of some urgency. Some individuals probably can (and probably will) put up with a few more headaches while they await the provision of a more acceptable environment. But others cannot. Medical evidence shows that for some individuals, sensitivities can multiply rapidly during continued exposure to pollutants, and the result can be continuing and disabling illness even in children. (This kind of effect has been reported by some parents and teachers in the Toronto system. See also Appendices A and B).

During this study, no research was encountered which would make it possible to predict which individuals among those who are already reacting to environmental exposures would be most likely to experience a worsening of their condition under continued exposure.

The answer is, therefore, a disturbing one - for some individuals, pollution is critically important. It is no consolation to those who are badly affected by it that the air quality may be acceptable to the majority.

Even more disturbing is the idea that other factors may be just as important to other individuals. One person may be virtually unaffected by pollutant exposures, but suffer chronic infections due to dryness of the environment.

The pattern emerging is that the Board must focus as much on individual needs as on the environment. There is no magic environment that will be right for everyone. Each school building needs to be flexible enough to accommodate a wide range of needs within its walls.

This conclusion may be in stark contrast to present approaches taken by industry. But schools are not factories. In factories, people are chosen to come into the factory and make products. Rightly or wrongly, the people are chosen to fit the factory's needs; if they cannot stand an environment that is acceptable to the majority, they are often excluded.

In schools, the students **are** the product. They cannot or should not be excluded if they don't fit. Excluding teachers who cannot tolerate an environment acceptable to the majority does not solve the problem either. If they can't stand it, there will be students who also can't stand it. If teachers stay and suffer, education suffers. In schools, the environment and the products brought in to serve the people inside should be chosen to fit the people.

2.5 What Gaps Are There in Our Understanding of Pollution and Education?

The gaps in our understanding are many. This section discusses a number of key areas that we see as needing more research in the future by many different organizations. Any further suggestions that readers may offer will be welcomed.

Do the gaps justify waiting before action is taken? In our opinion, **no.** But certainly any action that is taken should be taken carefully, with full awareness of the unknowns in this field. The present information is almost like a sponge - there is enough structure to tell the shape of things to come, but there are still many holes. Here are the shortcomings:

a. the data available is based on limited observation and is not easily extrapolated to the school environment

Many of the references we have reviewed discuss specific effects of individual pollutants. But the number of experiments that have been done are still few, and the range of exposure conditions that have been tested is often too narrow to help us predict what could really happen in a school environment.

For example, most of the information deals with higher levels of chemical exposure than may be common inside schools. Some experiments have been conducted at low levels, but there is not enough experience to say that such experiments have been adequately replicated and proven beyond a shadow of a doubt.

It is instructive to know that at high exposure levels adverse effects have been observed. We do know from other observations that there is a wide range of vulnerability in the population, rather than a simple threshold of exposure above which everybody is affected equally, and below which no one is affected. If we accept that there are differences between individuals, it is reasonable to expect that some people will experience effects at lower levels than those which have been tested. But it is not logical to assume that the effects will always be of the same type or intensity. And there is no information to help us predict how many people may react at lower levels. This leaves very little "hard" data to go on.

For some substances, of course, the scientific data is relatively clear. Benzo-a-pyrene, for example, a polycyclic aromatic hydrocarbon that is a constituent of cigarette smoke, has been shown to be a potent carcinogen. We assume, then, that there is risk involved in almost any exposure to benzo-a-pyrene. The **level** of risk, however, is not nearly as clear. And estimates of risk in the scientific literature are often confined to a prediction of the number of deaths per year among a large population, without any guess as to the number of people who may experience discomfort, illness, or disability.

What the data does for us is show that the pollutants discussed are at the very least **potential** offenders. Taking the data much farther than that puts us on shaky ground. Fortunately, the Toronto Board of Education does not have to set or justify national standards for pollution exposure - it merely has the task of providing suitable environments for education. The Board can, if it wishes, err on the side of safety and caution, and avoid introducing potential offenders into school environments.

The holes in the data force the Board to be experimentally oriented, which in many ways can be considered a good thing. We cannot from the literature presented assume that any given level of pollutant in the schools will be safe for everyone. The unknowns require that further observations always need to be made to confirm (or deny) our assumptions. In the past, it was assumed that many materials, including paints, would not bother people in schools. The personal observations of parents and staff, described in Appendices A and B, would suggest otherwise.

b. the range of people's vulnerability is not well understood

Similarly, there is very little information which helps to clarify how wide a variation in response to pollutants there is across the population. There were no supportable estimates, for example, of the percentage of chemically susceptible people in the Canadian population, or among children of school age. There were not even any useful "operational" definitions of chemical susceptibility, which would enable someone to say for sure - either you have it, or you don't.

This gap makes it very difficult to decide what standard of air quality is required for most people in the schools. It also makes it difficult to estimate how many people may require more stringently controlled environments.

What we do have is qualitative information - people vary widely in their vulnerability. This alone is an important fact. It dictates that attention must be paid to individual susceptibility, if we are going to be able to provide environments that will ensure every student's health.

c. there are as yet no indoor air quality exposure standards

Even if there is a wide range in people's tolerance for pollutants, it would be nice to have a starting point - some standards of air quality for school air that could give some assurance that most of the students and teachers would not be at risk. If problems arose at those levels, the environment could be adjusted further.

Unfortunately, most air quality standards in Canada are intended for outdoor air. The Federal and Provincial governments are presently working on a set of guidelines for indoor air, but the results of the task group handling this project are not yet available. These guidelines, when ready, should provide a starting point for the following pollutants: radon and radon daughters, carbon monoxide, formaldehyde, oxides of nitrogen, carbon dioxide, water vapour, biological agents, aldehydes other than formaldehyde, oxidants, lead, pest control products, chlorinated hydrocarbons, product aerosols, fibrous materials, and tobacco smoke.

Standards for ventilation have been prescribed by the American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE, Standard 62-1981). These, however, are presently the subject of debate and are in the process of revision. ASHRAE Standards are and have been part of normal engineering practice. If they were totally effective in providing acceptable indoor air quality, the Toronto Board would not have continuing complaints arising in schools where ventilation has already been increased a great deal in response to air quality problems.

In the interim, while the standards bodies and government agencies make up their minds, the Toronto Board and other organizations must come to their own conclusions. It is perhaps easier under these circumstances to remember that no set of guidelines or standards is likely to account for the full range of vulnerability in the school population. The individual must always be able to speak up about problems that arise, and schools and school boards should never hide behind standards as an excuse for not trying new ways of investigating and improving the environment for those who are having difficulty.

d. there are not many methods for recognizing when pollutants are involved in illness, behaviour or learning problems

Recognizing when a child's illness is pollution-related, and when it is not, has not yet reached the state of a practical science. Some techniques are now available for observing the effects of chemical exposure, but they can hardly be described as convenient and without risk.

Limited work has been done in Canada and the United States on various forms of exposure testing ("challenge testing"). In such testing, a person is exposed to a single substance or item under conditions where many other variables are kept under control, for example, in a hospital 'clean room'. Other versions of challenge testing have been developed which involve injections of minute quantities of pollutants, usually done within a physician's office or clinic. These are still very much in the experimental stage, and considerable controversy exists over their advisability and efficiency.

Rather, clinical judgment and relatively informal field experiments have been the norm for many years, instead of hard science. For example, if an art teacher gets rashes when demonstrating finger paints, his or her doctor may advise the use of rubber gloves. The teacher tries them, the rash goes away, and that is that. Usually both doctor and patient have been satisfied that the demonstration has been sufficiently rigorous to confirm probable cause and effect.

Such informal science can be an excellent source of guidance, and under the circumstances, may be all that is practically available to the Board of Education to use on a wide scale within the system. Yet many problems are not as clearly unravelled as the example of the skin rash. They do require more controlled conditions to determine cause and effect with confidence. (In Section 4 "Recommendations", we discuss the possibility of developing special low-pollution classrooms which would help to provide such controlled conditions, and therefore assist in revealing the cause of some of the indoor environment complaints that have arisen in Toronto schools.)

Clearly the middle road is to use a combination of clinical experience and the best of science. It would be of great benefit to learn how to harness simple, everyday classroom situations and turn them into informal experiments. Appendices A and B of this report demonstrate the value of listening to parents, who are the best clinical observers of their children. But it would be equally reassuring to know that much more sophisticated methods could be called in when necessary. It is this latter area that requires a great deal of research.

The trend, fortunately, is toward the development of better testing means. As they are made available, the Board can take advantage of them. Pollutant measurement technology has advanced rapidly. It now includes the capability to measure trace amounts of pollutants that have entered a person's bloodstream. Exposure to pollutants is therefore relatively easy to prove.

At the same time, advances in neurotoxicology and the behavioural sciences have provided many ways for measuring subtle changes in body and brain functions under different conditions. A full investigation of such methods was beyond the scope of the present study, but the area remains a fruitful one for seeking practical tests that could be applied within the school setting.

e. we need more knowledge about the effects of the internal environment of the child on health, behaviour and learning

This study barely scratched the surface of a field that could yield considerable benefit in the education of children with behaviour and learning problems. The internal environment of the child - his or her nutritional intake, food sensitivities, uptake of heavy metals and pesticides, ability to metabolize pollutants, and many other factors - deserves much more research and experiment, although considerable effort is still required even to gather together and put to use what has already been done.

Clinical research has determined that conditions such as internal yeast infection may significantly alter a person's ability to tolerate exposures to low levels of pollutants. Will medical treatment offer an alternative to extensive environmental changes in some cases? In other cases nutritional therapy appears to have increased people's tolerance to pollutants. It is clear that a two-pronged attack would be advantageous - simultaneous research on environmental improvements and medical on advances to reduce hypersusceptibility.

The trend in today's knowledge is to expand the number of factors that could be at play in the impairment of children's abilities. No longer are problems always considered chronic, congenital, or incurable. More researchers are seeking ways of adjusting the internal or external environments to help the child improve. More work is needed in this area. At the same time, the Board of Education must continue to keep up with work that is taking place, and devise ways of taking advantage of it (see Recommendation 8).

f. ways of treating chemical susceptibility are badly needed

The state of the art in the treatment of chemical susceptibility, while vastly improved over the situation decades ago, still leaves a great deal to be desired, in terms of knowledge, trained medical personnel, and appropriate facilities.

The kinds of experiences related by teachers and parents in the Appendices to this report are, we have been told, the tip of the iceberg. The Board of Education will have a better idea in the coming months and years, as these topics receive wider discussion, the extent of the chemical susceptibility problem apparent within the school population in Toronto.

A common theme that we heard is that there are few physicians, few techniques, and few facilities that are available to persons who have this kind of difficulty. Few people had ever received any warning or instruction from their doctor, from public health officials, through the schools, or through any other sources, on the potential danger of the twentieth-century chemicals that we and our children contact regularly in our daily lives. Physicians practising in the area of environmental medicine have also stressed the need for detailed education of families whose members are hypersensitive, since a great deal can be done by the individual or by the family to improve the condition.

The gap in public awareness, medical knowledge, and in public health practice in this area can only lead to an increase in illness and disability, if the sampling made available to the authors during this study is at all representative of other sectors of our society.

A full-fledged attack on this problem by all responsible agencies would make the job of the Board of Education considerably easier.

g. how do we know when something is truly "toxic"?

The information gathered in the literature for this study may leave many more questions in the reader's mind than answers. One of the most important questions insofar as the Board of Education is concerned is that printed above - how do we know when a situation is "toxic" and how do we know when we have made it safe, at least for most people?

We have highlighted the differences in people's tolerances to pollutants. This suggests the following situation as an example. A number of the persons described at the public meetings and in letters from teachers and students were able to remain relatively well as long as they carefully avoided particular exposures, such as chalk dust from the blackboard, tobacco smoke in staffrooms and washrooms, or formaldehyde in the laboratories.

As long as the remaining persons feel relatively well, is the situation 'non-toxic' for most people? Or could they be experiencing some less noticeable, but still detrimental effects? Should all exposures be minimized, or should sensitive individuals be protected? Where do we draw the line?

The answer lies in better information about the biological effects of each substance being considered. Very few substances have been investigated in the kind of detail necessary to answer such questions.

One which has been subject to millions of dollars of research is tobacco smoke. In this case, evidence seems to indicate that all people exposed to the carcinogenic substances in tobacco smoke, whether directly or second hand, are at increased risk of illness.

Formaldehyde is suspected to act as a carcinogen, which could mean it is a risk to all, but it is also known as an allergen, which may mean it poses a risk only to certain sensitive individuals. Under some conditions, too, it is known as a sensitizer, which means that it could convert a non-risk person into a person at high risk.

At the other end of the scale are natural substances. Lawn grass has not been banned, although many people react violently to its pollens in the summertime. Mould is everywhere in varying quantities, but not everyone is highly sensitive to its spores (though it too can be a sensitizer in sufficient quantities).

The disturbing truth is that for most indoor and outdoor pollutants, not enough is yet known about any of them to say with certainty whether they are truly safe for most of the population at the levels they are commonly encountered in our communities and in school buildings. This uncertainty will be with us for many years to come, and a strategy must be devised which is acceptable to all at our present state of knowledge.

The middle road on this question is a two-way street. Where possible, exposure to pollutants that are known to be toxic, or that are unknown in their effects, should be minimized for everyone. If measures taken to protect the majority are not sufficient for those at the sensitive end of the population spectrum, then special measures need to be added to respond to their needs.

We must be prepared to find out in the future that sometimes we may have erred toward caution unnecessarily, and sometimes we may have done only for a few what would have benefitted everyone. The present state of knowledge leaves us no choice, in many cases, but to guess at the right answer.

h. what procedure can we rely on for solving environmental problems in the schools?

Unfortunately, one of the largest gaps in the present literature on indoor environmental problems is a proven set of procedures which will lead you to the right solution when an environmental problem is suspected. What is needed is a checklist of things to do, similar to what a pilot and crew follow before takeoff in an aircraft.

A number of procedures have been suggested at recent conferences on indoor air quality. There is not good agreement yet, however, as to which are reliable and which are not. Many thousands of air quality measurements have been taken in so-called problem buildings, but they and the subsequent adjustments suggested as a result have not always led to a decrease in complaints about the environment within such buildings.

To date, very little has been done in large-scale building investigations to take into account the fact that people are reacting physically in a unique, individual manner, based on their own pollutant tolerance and many other factors that may be different from one person to the next.

One of the first tasks required in response to the problems that have been identified to the Board during this review, is the development of trouble-shooting procedures that are appropriate to schools. This must be done largely by trial and error. The experience so gained may provide a list of rules for others.

i. how many things in our environment are neuro-toxic?

While some research has been cited in the previous sections regarding the effects of pollutants on brain function, it is still safe to say that very little is truly known about the neurotoxic properties of various products and materials that are commonly used in our schools, community or homes. To this author's knowledge, this gap is not so much the result of inadequate technologies, as it is a matter of not yet bothering to look. A great deal of funding and research are needed in this area, which is of considerable importance to many Boards of Education across Canada who provide special education for learning impaired students.

The Canadian Association for Children with Learning Disabilities has advised the Board from their own research that good lists of factors in the environment that contribute to impairment of the brain, or learning disabilities, have yet to be prepared. They noted further that there are no accepted screening questionnaires or test batteries to monitor neurotoxins in children, and there are yet to be produced acceptable, non-invasive tests for monitoring heavy metal intake as well as chemical and food sensitivities that may contribute to such impairment.

j. little is known about interaction with other factors

It is well known that two factors may combine to give effects that could not be predicted from the effects of either acting alone. The effects of pollutants may be either enhanced or diminished by other factors, such as nutrition. Sufficient research has been done to indicate in general that this can and will happen, but insufficient detail has been achieved to help this investigation on specifics questions.

For example, experience with photochemical smog outdoors suggests that ultraviolet light from indoor fluorescent fixtures could act upon hydrocarbon and other pollutants indoors to produce a similar effect. No detailed research has been done. Other research suggests that nitrogen dioxide from combustion sources may combine with certain classes of pesticides that are sprayed indoors, producing thin films of potent carcinogenic compounds.

Some physicians have suggested that exposures to indoor pollutants and food allergens simultaneously may cause illness in some individuals, even if either alone are well tolerated in quantities normally encountered.

The point is easily made, that while little is known about the direct effects of indoor and outdoor pollutants on education when they are acting singly, even less, and in most cases, **almost nothing** is known about their effects when acting in combination with other pollutants and with other factors in the environment.

What course should a Board of Education take? The natural desire is to begin to eliminate some of the unknowns.

2.6 What Can We Conclude?

This section summarizes in simple form a number of conclusions that are supported by the literature reviewed:

a. that polluted indoor and outdoor air can make some people sick

b. that many specific indoor and outdoor pollutants have been shown to be potential hazards for at least some people, including:

    - nitrogen and sulphur dioxides
    - exhaust fumes including carbon monoxide
    - fibrous materials such as asbestos
    - tobacco smoke
    - polychlorinated biphenyls
    - various pesticides and herbicides
    - lead, cadmium, mercury and aluminum
    - methanol
    - formaldehyde
    - assorted volatile hydrocarbons
    - biological agents (viruses, fungi, bacteria)
    - inhalant allergens (moulds, dusts, danders)

c. that there is a wide range of vulnerability to pollutants among the population, and that sensitive individuals can be adversely affected at exposure levels below toxic limits

d. that the number of people who can be badly affected by indoor and outdoor pollutants is not known, but is sufficiently large that there may be some in every school

e. that some pollutant exposures can render an otherwise healthy person hypersensitive to chemical exposures

f. that other events can also trigger an increased susceptibility to pollutants (e.g. viral infection, yeast infection)

g. that many common pollutants are potentially neurotoxic, and may affect behaviour and learning

h. that many materials and activities in schools, including renovation, can cause sufficiently high pollution levels to adversely affect at least some staff and students, including:

- tobacco smoking
- painting
- use of pest control products
- science and industrial training activities
- art materials
- faulty heating systems
- cleaning products
- office copiers, especially methanol copiers
- floor coverings
- perfumes

i. that inadequate ventilation of areas with multiple pollution sources can lead to unacceptable conditions

j. that numerous other factors can also adversely affect behaviour and performance, including:

- nutritional deficiencies
- food allergy
- noise
- light and other electromagnetic radiation
- temperature and humidity
- psychological stress

k. the bottom line:

Can pollution affect health, behaviour and learning? **YES.**

3. POLLUTION AND EDUCATION IN TORONTO

3.1 Does Pollution Affect Education in Toronto?

Toronto is not exempt from the effects of pollution on education that are described in the literature summary in Section 2 of this report. Certainly many of the conditions described in the literature citations are present in some Toronto schools and in the communities surrounding them.

The following sections will highlight different problem areas within the Toronto school system. Readers are also invited to review Appendices A and B which summarize in more detail the experience reported directly by teachers and parents. The full texts of the written submissions may be found in Appendix F, which is available within the Board Library at 155 College Street in Toronto.

3.2 The Experiences of Students, Parents and Staff

During the course of the study, two public meetings were held and several hundred pages of letters and briefs were received from parents, teachers and other interested individuals and organizations.

It was a surprise to the research team that reports of indoor environmental problems predominated over outdoor environmental problems. The adverse effects of painting within the schools, for example, were cited over and over again by both parents and teachers.

It was also readily apparent that those who responded were very knowledgeable concerning the effects of pollutants on people, and that many have had considerable experience in adjusting an environment to lower indoor pollution levels and decrease illness. Many detailed suggestions were received that could be put to good use within Toronto schools. It is important for Board and school officials to recognize that the responses received during this study represent part of the solutions, not part of the problems.

Many respondents reported that despite their having spoken up in the past, the environmental conditions causing their difficulties had not been improved, in some cases over a period of many years. Some people have been met with skepticism and lack of understanding. Others felt that those whom they approached had been very co-operative and understanding. Even in these cases not all the problems had been solved. (Communication about pollution problems is discussed further in Section 3.5.)

The following pages list a number of the problems that were described, and the kinds of symptoms that were experienced. These are listed alphabetically rather than in order of frequency, and may refer to schools in Toronto or elsewhere.

Problems cited in briefs and presentations received

acrylic caulking compound
aerosol products
air fresheners
ammonia cleaners
art materials in open containers
art supplies
badly vented science labs
benzene thinner for silk-screening
brush cleaner
car exhaust
carbon monoxide
carbonless copy paper
carpet glue
carpeting in classrooms
central air conditioning system
chalk dust
chemically-treated mops
chlorine from swimming pool
classroom too warm
cleaners used to clean toilets
cleanser used for general cleaning
cockroach and termite spraying
cold air
computer/TV monitors
copy supplies in small rooms
dangerous fumes during fires
deodorizing products
disinfectants
dry air
dust in the classrooms
exhaust fumes from school buses
floor polishes and waxes
fluorescent light
formaldehyde used in dissections
fumes from industrial shop
fumes from jewellery-making
fumes from oil-painting
fumes from school incinerator
fumes from silk-screen printing
gas from bunsen burners
gas heating
glue
gym mats
hair cosmetics in washrooms
herbicides
inadequate fume hoods in science labs
inadequate ventilation
inks in office machinery
lack of windows and sunlight
lacquer-like odours from local industry
marker pens
methanol in copying machines
mineral spirits and paint thinner
mould inhibitors
mould growth in paint cans
natural gas fumes
neighbourhood lead pollution
noise pollution due to open plans
office equipment in commercial class
oil fumes entering the classroom
oil-base paint
overcrowded classrooms
painting the school
paints with quick-drying solvents
paper pollution
particleboard shelving
perfumes
pesticides
pets or experimental animals
photocopy machines
plants in the classroom
poor air circulation
poorly ventilated darkroom
preservatives on playground structures
recirculation of germs and dust
renovations
repairs using contact cement
rug cleaner
sawdust
scented cosmetics
scented washroom products
smells from re-roofing
smells of laminating machine
spray paints
stale or foul smelling air
storage of rags and flammables
strong cleaning products
strong-scented hand soap
synthetic carpet with rubber underpad
synthetic curtains
tarring of roofs
tobacco smoke
typewriter cleaners
unventilated pottery kilns
use of chemical cleaning compounds

Symptoms cited in briefs and presentations received

absenteeism
academic difficulties
aches and pains, aching muscles
aggravation of medical condition
aggravation of sinus, nasal passages
allergies or allergy attacks
allergy requiring strong medication
apathy
asthma attacks
back pain
bad breath
behavioural changes or problems
bladder urgency
bleeding gums
blocked nasal passages
blurred vision
body stiffness
body temperature fluctuations
breathing problems
burning eyes
bursting into tears
chest pains
collapse
confusion
constant tiredness
coughing
cramps
crying
dark circles under eyes
defiant and argumentative behaviour
depression
deterioration in drawing ability
development of dust and mold allergy
development of infections
dexterity problems
diarrhea
disorientation
disruption of concentration
dizziness
double vision
drowsiness
dry cough
dry skin
emotion lability
exhaustion
eye irritation
fainting
falling asleep
fatigue
flu-like illnesses
stomach aches
stuffy nose
frayed nerves
frequent illness
frequent urination
grey-coloured skin
handwriting changes
headaches
hives
hoarseness
hot and cold sweats
hyperactivity
illness requiring absence from school
inconsistent learning
inner ear problems
itchy eyes
joint pain
laryngitis
letter reversals
looking pale
loss of hand co-ordination
loss of memory
loss of muscle control
loss of voice
mental confusion
migraine headaches
muscle fatigue
nausea
nose bleeds
over-reaction to stress
poor motor skills
puffy eyes
rashes
recurrent fever
runny eyes
runny nose
seizures
sensitive to light
sensitive to loud noises
severe respiratory illness
short temper and irritability
shortened attention span
shortness of breath
sinus congestion
sinus headaches
skin problems
sleep disturbance
slurred speech
sneezing
sore legs
sore throat
stomach aches
unusual taste and smell problems
very red cheeks, ears or lips

swollen fingers
swollen glands
throat irritation
thyroiditis
tinnitus
unfocused thinking
vision problems
vomiting
watering eyes
weakness
withdrawn
yellow/green skin

3.3 Indoor Environmental Problems in Toronto Schools

Twenty-seven Toronto schools were named explicitly by respondents, board staff and Trustees, usually in connection with discomfort or illness that the respondents or their children were experiencing.

There were additional submissions that cited difficulties individuals were having within many schools that were not named. A number of respondents emphasized that the testimony we were receiving was 'the tip of the iceberg'. Some noted that friends, neighbours, or colleagues were also experiencing difficulty.

Those schools mentioned explicity are listed below, alphabetically. Other schools could be in a better or worse position. Their exclusion means only that they were not named explicitly by individuals during the period of the study.

Allenby School
Alternative Primary School
Bedford Park School
Bickford Park High School
Brown Public School
Central Technical School
City Adult Learning Centre
Contact School
Davisville Public School
Dundas School
Eglinton Public School
Glenview Senior Public School
High Park Alternative School
Jarvis Collegiate Institute
John Fisher Public School
Lawrence Park Collegiate Institute
Market Lane Public School
Northern Secondary School
North Toronto Collegiate Institute
Perth Avenue Public School
Quest School
Subway Academy One
West Toronto Secondary School
Western Technical School
Wilkinson Public School
Winona Drive Senior Public School
Withrow Avenue Public School

The information discussed in the literature summary suggests that it would not have been surprising to have some problems reported at every school. Does this mean that the Toronto school environments are generally unsafe? In most cases, probably not, but each problem reported does require investigation and action until it is solved.

It is clear from the response that some parts of some schools definitely are unsafe for some people. It is also clear that in some schools, problems may be localized within one or two rooms, or within one floor or one wing. Some schools appear to present problems for a significant portion of the staff or students (e.g. Withrow Avenue Public School, West Toronto Secondary School, and Wilkinson Public School). Others may only present problems for a few. (For further information on Withrow, West Toronto and Wilkinson, readers are referred to pages B-8 to B-10, pages B-29 to B-31, and pages B-32 to B-33 respectively. Relevant recommendations can be found on page 87.)

a. "school-safe materials" may be required in the future

Many materials presently used in Toronto schools are not "school-safe" - that is, they contain or emit substances that can be harmful to sensitive students and staff. These materials may not be considered hazardous in the traditional sense, since their emissions may be well below toxic limits if they are used according to instructions. They may even be labelled 'nontoxic'. Yet there are people within the Toronto school system who react adversely to them. The list includes such things as paints, cleaners, chalk, and numerous science and art materials.

The problem lies partly with the fact that most such substances were never tested for the possibility of such reactions. Nor were they ever tested for their ability to contribute over time to the sensitization of students and staff. The Board has the responsibility to provide, wherever possible, an environment suitable for the education of all of its students and one in which all of its staff can properly do their job. Future medical research may provide some hope that hypersensitivity can be reduced more quickly and effectively than is possible today, Meanwhile, education must go on.

Conversion to "school-safe" materials will take considerable time. The Board initiated a procedure to find such materials on March 7, 1985, when it approved tenders for the supply of vinyl tile and carpeting conditional on the undertaking over the following six months, to learn more about health-associated problems, to institute procedures to minimize effects caused by the installations, to seek alternative products, and to seek outside research and funding assistance.

The development of these procedures for floor coverings will provide a basis for the gradual extension to all school materials. The goal is to find, or stimulate manufacturers to provide, materials which meet a much more stringent standard of safety and low emissions.

In the interim, information that has already been gathered by Board staff regarding the constituents of school materials can be used with a view to adding extra precautions where emissions are known to occur with the present materials. Making staff, teachers and students aware of potential emissions from materials and of the information already gathered may help to avoid health problems while alternatives are sought for products which appear to be causing the worst problems.

In many cases materials will by their very nature require special conditions for their use. For example, art materials may emit pollutants during their application, but dry to a smell-free state. Science and industrial materials may include substances that cannot safely be handled in unventilated areas. Some activities may produce materials that can affect people (e.g. baking materials in a kiln, combining materials in a reaction during a chemistry experiment, sanding a piece of furniture). The Board will need help from teachers and others involved in these activities, to review present materials and procedures, and design suitable methods which will avoid risk of health problems, particularly for individuals who have already become sensitive to environmental exposures.

Increasing awareness among all staff and students should become in itself an important part of the school curriculum (see Recommendation #4). In the short term this may be seen as an inconvenience and an unnecessarily cautious approach. In the long term, the ability of graduates of the Toronto school system to recognize and protect themselves from undue exposure to potentially harmful twentieth century chemicals may help a significant number of them to avoid the kind of problems that have been reported to the Board during the study (see Appendices A and B).

The accumulated experience of staff and students is the Board's most important asset in choosing "school-safe materials". No testing procedure will anticipate all the problems that may arise, since the kinds of reactions to many existing materials seem to be very individual and unpredictable. Some materials may turn out be acceptable for general school use, but may be restricted from use in local areas set aside as low-pollution classrooms for sensitive individuals (see Recommendation #6). New procedures for obtaining feedback from everyone who experiences difficulties are also suggested (see Recommendation #3).

b. painting and other renovating activities topped the list of complaints

Feedback from teachers and students during this study demonstrated clearly that painting and other renovation activities within Toronto schools have been associated not only with discomfort in some cases with severe and continuing illness. Many more precautions than are now being taken may be necessary to protect students and staff from sensitization or from aggravation of existing sensitivities.

Many factors can be changed for a given renovation project: the choice of materials, the methods of construction (e.g. screws vs. glue), the time of day, week, or year (e.g. painting in summer months), the ventilation of both the area being renovated and of the remainder of a school, the way of isolating the renovated area from the remainder of the school, whether air filters are used, whether the renovated areas are left unused during an initial gas-off period, the method of alerting students and staff, the measures that are taken if health problems do arise, and many more.

Although not a great deal is known about environmentally-related illness, physicians dealing with the problem indicate that attention must be paid to the total load of pollutants a person is exposed to, in addition to their particular reaction to any one pollutant. For this reason, schools in areas of high outdoor pollution should be designated as priority schools for increased precautions insofar as indoor exposures are concerned. In particular, painting should not be undertaken during the school year in such schools. Careful monitoring of emissions and reported effects even with other precautions cited above will help the Board decide over time whether the same level of precaution may also be justified in all schools in the system.

The number of people reporting problems with painting in the schools, and the severity of the effects reported by a number of them indicate that this problem should receive high priority attention by Board staff in the coming months. However, it is important to recognize that the problems the Board faces are broad - it is not just one or two materials or activities that are the problem. The Board requires a way of looking at all activities that will avoid problems in the future.

Section 4 (Recommendations) outlines action that can be taken to address specific indoor air pollution problems in the schools.

3.4 The Effects of Outdoor Pollution on Education in High-Pollution Areas

There are many areas within the City of Toronto in which children may come in contact with pollutants that could impair their health or their ability to learn. (See map in Appendix C, Toronto Board of Education, 1981.)

Throughout the city, there are airborne and dustfall pollutants, including lead, resulting from the combustion of gasoline in automobiles. In many areas, there are also industrial pollutants, drifting from factories and smokestacks into nearby residential neighbourhoods.

Three areas in particular have stood out in recent years, although this section is not intended to be confined to them. The Junction Triangle area in the western part of the city has been subject to fumes from nearby paint factories and other industries with highly volatile emissions. Two other areas are adjacent to lead recycling operations - one in South Riverdale and the other in the Bathurst and Front St area.

In all three areas, emissions from the offending plants have been adjusted downward over a period of years, reducing the airborne problem but leaving it still less than acceptable. In both of the high-lead exposure areas, however, there is also a legacy of contaminated soil that is partly responsible for the lead uptake in children now living there.

Presentation of a complete history of the investigations of pollutant emission levels and lead absorption levels in these areas is beyond the scope of this report and has been well covered by others. Readers are invited to enquire of the Toronto Board of Health and the Ontario Ministry of Environment for background documentation and detailed data.

Rather, this section will present a number of more general points about actions that are required for the high exposure areas and for the City of Toronto as a whole. Both the authors and the Pollution and Education Review Group feel strongly that these issues are of critical importance to the health and education of children in Toronto.

a. we must stop debating whether present levels are acceptable and start asking how we can move faster to eliminate the problem

Readers are referred to Section 2.1. of the literature summary, to the detailed bibliography (Appendix C), to the experiences presented by Toronto residents and others (Appendices A and B), to the Recommendations (section 4) and to various other relevant sections within this report which can be located by looking up appopriate keywords (such as "lead") in the subject index.

The evidence presented is clear - many pollutants are health hazards and can affect brain function, learning ability and behaviour. Lead is one of the most obvious and best proven threats to education of our children, though it is by no means the only one. The long term solution is also clear - sources of lead contamination and other major pollutants both of people and of the environment should be eliminated.

Much of the focus in government circles has been on the question:

"How much pollution can they stand?".

We feel that just another long presentation about exposure levels will only serve to perpetuate a debate that is irrelevant. The Board of Education is not responsible for determining how much pollution people can stand and still pass their courses. The Board is responsible for helping children and adults in Toronto get an education. If lead and other pollutants are getting in the way of that education, then people must not be allowed to release them into our environment.

The point of most concern to the Board of Education should be whether current actions both within its own jurisdiction and by various other levels of government will eradicate Toronto's pollution problems as quickly as is humanly possible. The authors and the Pollution and Education Group have concluded that not enough is being done. We feel that our society cannot afford to risk long-term impairment of our children.

The following subsections discuss further the reasons behind our position and suggest additional actions that can be taken both to reduce this risk and to repair damage that has already been done.

b. people who are equally ill may be equally polluted

The Board of Education has for some time watched a series of studies by various levels of government which have attempted to compare the degree of ill health or pollution uptake of children and adults in one area with the degree of ill health or pollution uptake of people in other areas (see further discussion of health studies under 'Junction Triangle' in sections following). The implication of this approach to studying the effects of pollutants has been more than clear to the citizens being investigated: many people in the government agencies responsible for health and environment must not believe that pollution can be a serious problem. Our evidence suggests it is.

The message has also come across loud and clear to the public that unless you are demonstrably more ill than everybody else, you stand little chance of getting effective action to reduce pollution in your locality. People who suspect that pollution may be harming themselves or their children want something done to eliminate the cause and reverse the damage. It is no consolation to find that other people also have health problems or that other children are also learning-impaired. It is infuriating to have a problem dismissed because both your children and someone else's children may be equally polluted.

Many of the individuals who have written in to the Board of Education during this study have lived personally with the adverse effects of pollution. They know from bitter experience that when health problems and pollutants are both present, the possibility that they are connected cannot be ignored.

c. attention to specific effects on individuals has been lacking

One of the themes that has been repeated in many sections of this report is that more attention to specific effects of pollutants on specific individuals may be necessary to reveal the full role that pollutants are playing in illness and learning problems in Toronto.

Lead screening tests are being done to identify children who have taken in the most lead. Monitoring of health indicators for children in the Junction Triangle is about to begin. But much more could be done for individual children and adults who are experiencing illness in high pollution areas, to confirm the specific causes of symptoms and to supply comprehensive medical advice and treatment to begin to reverse pollution-related health damage.

The kind of proof that could be found by pursuing a dozen cases in full detail may do more to open the eyes of government ministers to the need to reduce pollution in Toronto than decades of population comparison tests. The technology and expertise now exists to monitor even subtle changes in health, behaviour, brain function, and pollution uptake. If there is a connection it can be proven.

A great deal of experience has also been accumulating in the treatment of those individuals who are the most sensitive to the intake of pollutants. Sometimes showing what will fix someone's health can help to prove what was wrong in the first place. If it could be demonstrated that the health and learning abilities of even a small number of children in the higher-pollution areas of Toronto improve when they are not exposed to their accustomed neighbourhood pollution, the need for further reduction of pollution might be more easily accepted.

d. are children in high-lead pollution areas adversely affected?

Lead pollution in areas adjacent to Toronto's two lead-recycling plants has resulted in high blood levels of lead in many children. Citizens have been raising concerns for many years about emissions from Canada Metals Ltd in the South Riverdale area, and Toronto Refiners and Smelters in the Bathurst and Front St area. Citizens in these areas recognize they are being exposed to lead from other sources as well (e.g. automobile traffic on the Gardiner Expressway), and have also requested action on other industrial pollution sources affecting their neighbourhoods.

Action has been taken over a number of years to address the problem of emissions from Toronto's two lead-recycling plants, and emission levels have been reduced significantly since the problem was first identified in the early 1970's. The Toronto Board of Health is presently working with community groups to provide to parents in high-lead areas information which may help their children avoid excessive accumulations of lead, for example, from ingestion of contaminated soil. The Toronto Board of Education and the Metropolitan Toronto Separate School Board are also providing a nutritional supplement program for schools in the South Riverdale area, in order to minimize the adverse effects of lead ingestion.

Soil samples have been taken, some soil has been replaced, lead levels have been measured in children, "isopleths" of soil levels have been drawn on maps, stack emissions have been monitored, and many actions have been taken by the industries to reduce emissions. A study has also recently been completed by the Eastern Area office of the Toronto Health Department (Birks, A., Ellis, E., Erb, J., and Whiteside, T., 1985).

Yet to date, residents in the area still are exposed to fresh emissions lead albeit in lower quantities. Much of the exposed soil in the area still contains high levels of lead. Some of the children still have elevated blood lead levels. Lead recycyling is still being carried on in the midst of highly populated areas. And residents are still concerned, and very rightly so, that their children may be suffering from these exposures. At a public meeting held by the Board of Education in February of 1985, one parent raised the issue quite dramatically. He began to notice that many children in his neighbourhood were now attending special classes because of learning disabilities. Had any one checked the possible connection with their lead exposures? No.

The Ontario Association for Children with Learning Disabilities has proposed a full study of the relationship of trace elements such as lead to neurological dysfunctions related to learning disabilities (J. Van Loon, 1984), yet has experienced difficulty obtaining Provincial funding for such a study. In Section 4 (Recommendations) of this report we have proposed that the Toronto Board of Education establish a study group that will advise the Board in this area, and develop a long term plan for exploring and implementing new knowledge about the effects of trace elements such as lead.

The evidence against lead has accumulated to the extent that we require a much more aggressive stand on the part of government environment agencies to eliminate further lead pollution while the full extent of damage caused by sources in the past is assessed and treated.

e. children in activities next to major roadways are at risk

Nor are children in other areas of Toronto exempt from the potential effects of lead intake. Wherever there is a roadway there could be elevated lead levels both in the air and in the soil. Automobile exhaust and the lead within it are common exposures for most of Toronto's school children. Their dangers have been unrecognized for too long.

Action on lead in gasoline was taken in February of 1984 by the Government of Canada under the Clean Air Act. An amendment to the Leaded Gasoline Regulations calls for a reduction in the level of lead in gasoline from .77 grams per litre to 0.29 grams per litre, effective January 1, 1977. There is considerable debate as to whether these measures go nearly as far as they could to address the lead pollution problem. A British Royal Commission on Environmental Pollution recommended in 1982 that all lead be removed from gasoline, and emphasized that there is no basis for postulating a threshold concentration for lead in the body, below which harmful effects might not occur (Canadian Association for Children and Adults with Learning Disabilities, 1984).

To help resolve the debate, Dr. M.C.B. Hotz of the The Royal Society of Canada has been appointed as chairman of a special Commission on Lead in the Environment, which will be delivering a preliminary report to the Federal Minister of the Environment in approximately September of 1985 (M.C.B. Hotz, 1985). Readers wishing to contribute to this Commission are invited to contact the chairman at the address given in Appendix C.

In the interim, the evidence presented in Section 2.1 and in the background references described in Appendix C should be more than sufficient to make people aware that children's exposure to lead must be minimized, and that exposure of children to automobile exhaust in particular should be restricted wherever possible.

Board Trustees have taken the position with respect to proposals for new development adjacent to existing schools such as North Toronto Collegiate Institute that uses which will increase vehicular traffic and pollution on the school grounds are not desirable. Likewise, the Board has publicly expressed concerns about proposals for a school and new residential development in the area presently known as the Railway Lands in the southern part of the city (Globe and Mail, Toronto, February 8, 1985, and Toronto Board of Education Minutes, Wednesday, May 1, 1985).

f. the Railway Land proposals would back a whole community right up to the edge of presently accepted environmental criteria

A recently released Environmental Overview Study prepared for the Railway Lands Steering Group (De Leuw Cather, 1984) does not appear to recognize in any practical way the potential health effects of industrial and vehicular pollution that are discussed in previous sections of this report. It follows the principle that as long as we are equally polluted, there is no problem:

> "In general, the Railway Lands air quality is no different than any other downtown Toronto site."

The authors note that major air quality indicators in the area, with the exception of dustfall, are "mainly within provincial criteria". (Dustfall is predicted to diminish once open soil areas are paved over or grassed in.) With respect to additional traffic expected to be generated by railway land development, the report suggests that it is not expected "to drive any of the key indicators above the acceptable concentrations". The report predicts that intermittent odour problems from nearby industries can be expected, and notes as well that industrial air plumes from Molson's, Victory Soya Mills, and Toronto Refiners and Smelters may be "intercepted" by new high-rise structures in the Railway Lands.

The report identifies specific precautions that may be required, such as reducing discharges of particulates where they exceed MOE criteria, examining the "interception" of industrial discharge plumes on a case by case basis, and designing large buildings near the road and rail corridor in such a way that their fresh air intakes minimize "the chance of intake of air containing unacceptably high contaminant levels". At the same time, it concludes:

> "Since the predicted air quality, after the development is completed, should remain significantly below the acceptable Ministry of Environment criteria, no new action or procedure should be required".

The time has come for environmental considerations to take into account the full weight of knowledge available today, particularly concerning the effects of heavy metals, carcinogens and other pollutants on health. It is clear to the authors and to the Pollution and Education Review Group of the Toronto Board of Education that future studies will also have to take into account the fact that a certain percentage of any neighbourhood population is likely to be already highly sensitive to levels of pollutants at or even well below existing criteria. Environmental studies for new developments will also have to begin to assess the effects of pollutants on learning, behaviour, and other brain functions, particularly of young children and other special risk groups.

It makes no more sense to back a whole community right up to the edge of the presently accepted environmental criteria, than it does to back a baby carriage up to an idling bus. The Board of Education and other organizations must recognize that development in downtown Toronto will continue. However, the Board can continue to take an active role to suggest that environmental conditions should be created that will be compatible with the kinds of activities people would like to undertake in the future in new development areas such as the Railway Lands. (See also Toronto Board of Education Minutes, May 1, 1985.)

g. Junction Triangle residents deserve to know how local industries have affected their family's health

During 1984 an extensive study was completed documenting health problems of residents of Toronto's Junction Triangle area and comparing their incidence to those of people in neighbouring areas and in a second area chosen to be representative of the rest of the city (W. Spitzer, 1984).

The researchers concluded that there was no difference in the health status of the adult residents of the Junction Triangle and those of the most comparable census tract of Toronto who were not exposed to the emanations from industry identified as being a problem in the Junction Triangle area. They did note that exposure to gas, fumes and odours in the Junction Triangle area was greatly in excess of that in the reference area, and greater than that in the neighbouring areas. Dr. Spitzer notes:

> "It is not desirable that residents in any particular area of an urban community should experience appreciably greater discomfort than those living in normative areas of the same city".

The study did not find the health profile for children as "reassuring" as that for adults, except that chronic, serious problems were not seen to be affecting them in a material way. The differences in the prevalence of cardinal symptoms over a two-week study period were clinically and statistically significant and there was a clear gradient from the Junction Triangle (worst) to the neighbouring area (better) to the reference area (best). Indicators of disability, debility, and school absenteeism showed no differences, and there was no difference in the use of doctors, health professionals in general, or of health facilities such as hospitals.

The research team concluded that there was enough evidence of unfavourable health experience among children in the Junction Triangle area to warrant more in-depth and more clinical evaluation of their health status. The design of the study "did not permit attribution of observed health outcomes to exposure factors in the same community".

The result of the first Junction Triangle health study is a second Junction Triangle health study (Toronto Dept. of Public Health, 1984a and 1984b). This followup study will include a more detailed health assessment of all children 0-14 years of age resident or attending school in the Junction Triangle census tracts. No followup studies on adults were considered necessary. The more detailed health assessment will include a hearing screen for those 3 years and older, an ear examination for those under 3 years, a skin examination, a nose swab, and a breathing check for children 6 years and older. Questionnaires and interviews will also be used in the study to gather further information. Children with health problems seen to require further assessment will be referred on to a specialist at the Hospital for Sick Children in Toronto for a more comprehensive check (Toronto Dept. of Public Health Brochure, 1985).

The Toronto Board of Education has taken the position that insufficient use is being made of available technology to determine once and for all whether any given individual in the Junction Triangle area is experiencing adverse symptoms which are triggered or aggravated by exposure to odours from local industries. The experience related to the Board by teachers and parents during the course of the present study of the effects of polluted environments on education suggests that it would be unusual if there were not both children and adults in the Junction Triangle who have been sensitized and who may be suffering from adverse effects from industrial effluents.

The Board has also learned, unfortunately too late for children in Perth Avenue School in the Junction Triangle, that painting within schools can be a significant aggravating factor for people who have become sensitive to low-level chemical exposures. The children in that area have now been exposed to paints both indoors and out, and it is indeed possible that some have experienced adverse effects from both.

At a March 19, 1985 meeting of the Toronto Board of Health, Education Trustee Fiona Nelson moved the following motion on behalf of the Pollution and Education Review Group of the Toronto Board of Education (Toronto Board of Health, March 1985):

> 1. That health professionals and technicians involved in the Junction Triangle followup health study should meet with physicians who have experience in diagnosing and treating chemical susceptibility, prior to conducting the study.
>
> The purpose of this contact is to assist in identifying all those children who may exhibit characteristic patterns of environmentally-related illness, but who may not be identified by the other tests being administered during the study.
>
> The Board of Education for the City of Toronto has offered to assist in making appropriate arrangements.

2. That investigative techniques now available in Canada and the United States for determining blood levels of volatile aromatic and chlorinated hydrocarbon chemicals be applied on a series of test cases during the Junction Triangle followup study to determine the extent of exposures to and uptake of environmental contaminants which are common in the Junction Triangle area.

3. That a third phase of study be planned which would, for individuals identified in the followup study, determine the extent to which they have been exposed to harmful chemical agents and which would determine the roles that such agents are playing, if any, in their symptoms. Such a third phase would include investigation and use of advanced technology and procedures which are presently being used, primarily in the United States, to confirm causation in cases of environmental illness.

4. That the third phase of study shall include investigation of medical treatments, lifestyle and environmental modifications which may assist persons determined to be affected by Junction Triangle pollutants in regaining their health, if that is possible within the environments available to them at this time. This phase should also include education of both people determined to be affected, and other interested people in the area, as to the characteristics of environmental illness and the nature of treatments and other actions which may reduce those adverse effects.

5. That the Provincial Departments of Health and Environment shall be invited to observe and co-operate with efforts on the part of the Toronto Board of Health to determine causation and to alleviate adverse health effects, if any, which are determined to be related to the Junction Triangle environment.

6. That the Toronto Board of Health shall be aware of the Toronto Board of Education's concern that the presently planned Junction Triangle health studies do not make adequate use of technology and experience available in the field of environmental medicine. They fall short of what is necessary to determine causation of illness in specific cases, and what is necessary for prescribing appropriate and timely remedial measures and medical treatment for those who are adversely affected. Furthermore, failure to take advantage of available techniques for determining the roles of locally generated pollutants in the health of specific individuals has unnecessarily delayed both the cleanup of the area by the industry and the province and provision of adequate medical advice and care for those affected.

The Junction Triangle situation is very similar to that of many indoor environments as discussed in Sections 2.1 and 2.2 of this report, as well as in a number of references listed in the bibliography in Appendix C. Here are the similarities:

1. there are diverse sources of pollutants
2. there are occasional transient peak odours, but for the most part all concentrations of volatile hydrocarbons appear to be within established outdoor environment guidelines
3. not everyone appears to be affected or disturbed by these emissions
4. some adjustments by industry have reduced emissions
5. complaints and illness persist

Even the component pollutants and concentrations are similar, possibly because the materials being produced in nearby factories will in fact end up inside offices which are typical of those measured in indoor air quality studies. For example, a survey of Junction Triangle air downwind from the Glidden plant at the end of May, 1984 yielded the following array of contaminants (Ministry of Environment, 1984, and Junction Triangle Environmental Liaison Committee Minutes, November 28, 1984):

weight	tentative identity	estimated concentation (parts per billion)
58	acetone	10
60	propanol	1
62	ethanediol	10
72	methyl ethyl ketone	10
86	methy acrylate/pentanone	1
98	maleic anhydride/fragment	1
100	methyl methacrylate/MIBK	1
116	diacetone alcohol/butyl acetate	1
120	acetophenone/phenyl acetaldehyde	1
132	ethylene glycol ethyl ether acetate	1
138	isophorone	1

The measurements were taken with a TAGA Trace Atmospheric Gas Analyzer on a day with somewhat variable wind speed and direction. Few substantial odours were present that day. The estimated concentrations were based on 20 instantaneous readings averaged over a 5 minute period. The results serve to illustrate an array of volatile organic chemicals at relatively low concentrations. These results are similar to the situations reported by B. Berglund (1982), N. Hijazi (1983) and others for the indoor environment. What we do know about the indoor environment is that some people really do get sick.

Transient peak odours have resulted in concentrations of other chemicals that were significantly higher, but still below Ministry of Environment guidelines for exposure. However, the possibility that there may be a number of people within the local population that are sensitive to levels significantly below Ministry guidelines has not been taken into account in many of the previous investigations of odour incidents.

For example, an incident on January 12, 1984, was investigated extensively by the Ministry of Environment (Singh, B.A., and Kawasaki, J., 1984). Several school children and teachers from the Perth Public School were exposed to strong odours at the Campbell Avenue open air skating rink on the afternoon in question. Several complaints of illnesses and absences from school were attributed to the exposure and led to an investigation of the incident.

The Ministry determined that the cause of the incident may have been the release of styrene from a nearby American Standard plant in which fiberglass bathtubs are made. The concentration of styrene within a spray booth in the plant was 19 parts per million, less than half the permissible indoor occupational standard of 50 ppm. Assuming full dispersal, the styrene concentration outdoors was calculated to be 0.01 parts per million, which is considerably less than the Ministry's ambient outdoor standard of 0.09 parts per million.

One possible explanation offered for the difficulties experienced by people at the rink was that dispersal was not complete. Assuming the other extreme, that is, no dispersal, would deliver a concentration of up to the order of 20 parts per million.

The Ministry noted that their health data predicted that illness should not be expected at this level of exposure. Their medical consultant advised that the exposure should not have resulted in any effect on the children, that the odour should have been pleasant, and that there would have been a wide margin for safety. The only way that the researchers could reconcile the incident and the calculations was to assume that the students' reactions might be explained by their engagement in strenuous exercise or by the presence of other chemicals in the emission. He also advised that it is unlikely that any untoward effects would be experienced by the students who were exposed to a low level of styrene for less than an hour. The possibility that some of the people exposed might indeed be sensitive to levels of 20 parts per million or either lower was not discussed.

Medical reports which describe individuals who are sensitive at minute trace levels of common chemicals have already been discussed (e.g. W.J. Rea, I.R. Bell et al, 1978, W.J. Rea, R. Smiley et al, 1980, C.F. Reinhardt, 1978, N. Collishaw et al, 1984, and others). Just as the Board of Education must be prepared to accept the possibility that numerous teachers and staff may be experiencing adverse effects inside schools from relatively low concentrations of various chemicals, perhaps other agencies must also be prepared to consider the possibility that the same phenomenon could be happening with respect to the outdoor air.

In addition to low level mixes of volatile hydrocarbons, and occasional higher peaks of certain chemicals, the Junction Triangle is subject to levels of nitrogen dioxide, carbon monoxide, sulphur dioxide, particulates, and total hydrocarbons that parallel or exceed those in downtown Toronto (Junction Triangle Environmental Liaison Committee Minutes, November 28, 1984). Possible effects of such chronic exposures on the health of children have been discussed in some detail in Section 2.1 earlier in this report.

h. the risks of burning polychlorinated biphenyls (PCBs) in residential neighbourhoods have not been properly assessed

The Ontario Ministry of Environment has proposed the burning of polychlorinated biphenyls (PCBs) in mobile units within the City of Toronto as a way of disposing of a considerable store of PCBs, mainly in the form of waste transformer oils. A great deal of the stored chemical is presently contained at the Canadian General Electric site on Lansdowne Avenue.

A Commission on the Regulatory Control of Mobile PCB Destruction Facilities was set up to review the proposals and accept public input. The remainder of the text in this section is taken verbatim from the submission from the Toronto Board of Education to the Commission, since it summarizes both the Board of Education's position and their reasons for it. It is based on information that has already been presented in the literature summary of this report.

The Board of Education for the City of Toronto has major concerns about the proposed use of mobile PCB destruction units within the City of Toronto. In some areas of the city, these units might be used in close proximity to homes and schools. The Board's concerns centre around health, behavioural and learning effects in school populations in areas adjacent to or downwind from destruction facilities. Above all, we feel that insufficient study has been done to predict the incidence of adverse health effects that could be expected in a normal school or residential population in proximity to a mobile PCB destruction unit.

Exposure to PCBs

The negative health effects of PCBs have been recognized since the 1960's. The Canadian Environmental Law Association (1984) states that PCBs have been proven to be carcinogens in laboratory animals and discusses documentation of reproductive damage in fish and birds. A severe incidence of human contamination that occured in Japan in 1969 is described which resulted in 16 deaths and several still births. Victims also suffered lesions, blindness, hearing loss, chloracne, inflammation of the joints, liver damage, behavioural changes and subsequent birth defects.

The risks of lower levels of contamination to both the general population and to especially vulnerable individuals, such as children, have not been adequately assessed. The Board therefore feels strongly that it has not been proven that people in proximity to mobile PCB incineration units would not be exposed to harmful levels of PCBs.

That the surrounding population would be exposed to some PCBs from mobile burning units is a certainty. J.E. Cotter and R.J. Johnson (1981) report results of an evaluation of the destruction, in two different high-efficiency boilers, of waste found to be contaminated by PCBs from a transformer leak. They reported a 99.9% destruction level of PCBs. The subsequent downwind concentrations of the remaining PCBs were less than recognized limits for industrial exposure, but were nonetheless present.

D.G. Ackerman and co-workers (1981) also quote studies that have indicated that fly ash and residues from PCB incineration contain low levels of PCBs. J. Steiner and co-workers (1980) present the results of a trial PCB burn in which PCBs were detected in the ash effluent from the rotary kiln at less than 50 ppm, the lower limit at which PCBs are regulated by the Environmental Protection Agency (U.S.). The range of vulnerability of residential populations is much wider than that of an industrial population. It is highly likely that this small level of airborne PCBs would constitute a hazard to at least a small proportion of the exposed population. No proposal can be evaluated properly without a quantification of this risk.

Exposure to Other Toxic Chemicals

PCBs are not the only concern for downwind populations. In addition to PCB material that might remain after incineration, other highly toxic substances can contaminate the air during the disposal process or remain in the slurry waste after burning. A 1981 report by the Environmental Protection Agency (U.S.) considered the risks and benefits associated with the incineration of PCBs at two commercial facilities. The researchers used computer modelling to show that significant levels of tetrachlordibenzo-p-dioxins (TCDD) and tetrachlorodibenzofurans (TCDF) would occur in the air of the residential communities surrounding the incinerator stacks.

The Ministry publication "Background Information: Establishing the Provisional Guideline for Dioxins and Furans" claims that CDDs and CDFs possess a threshold level of dosage which must be exceeded before the known toxic effects develop. However, there is scientific disagreement on whether or not such a threshold limit exists. S.M. Ray and N.M. Trieff (1980) state that safe levels of some toxins cannot be established. For many natural and synthetic compounds that have entered the ecosystem in the past 40 years, the adverse effects were unanticipated, until recently. Many compounds proved highly resistant to degradation by natural processes and many led to a pervasive buildup of contaminants on a worldwide basis. The authors state that in the case of carcinogens, mutagens and teratogens, including PCBs, thresholds cannot be established because even extremely small doses must be assumed to result in a finite increase in the incidence of response.

Much of the discussion surrounding the burning of PCBs in mobile units has also ignored the possible dangers from burning of other materials that are present in the waste oil, arachlor mixtures, and other base materials in which the PCBs are found. There is a high likelihood that such mixtures may contain chlorinated benzenes and other chlorinated hydrocarbons that are toxic to human beings. The high vapour pressures involved with some of these compounds guarantee that there will be some discharge of unburned chlorinated hydrocarbons during the operation. The incineration of such compounds suggests that attention should be paid to the effect of hydrogen chloride release. The vapourization and combustion products involved in handling and burning the entire range of compounds that may be present at mobile incineration sites have not been adequately investigated for their short and long range effects on the type of populations that will inevitably be exposed.

Adverse Effects on Sensitive Individuals

The Board of Education feels very strongly that insufficient attention has been paid to the fact that some individuals are more sensitive than others to chemical exposures at low levels. Children fall into this susceptible category. The potential effects on children of burning PCBs in their neighbourhood must be very seriously considered.

Hypersensitive individuals react to levels of pollutants that are well below what is generally considered to be the threshold level. W.H. Philpott and co-workers (1981) and W.J. Rea and co-workers (1978) make the observation that maladaptive central nervous system reactions can occur in susceptible people to otherwise nutritious food and/or so-called "safe" chemical levels. This high degree of sensitivity can be caused by a number of factors, including overexposure to chemical pollutants. L. Plumlee and S. Coerr (1979) and L.D. Dickey (1976) describe a variety of syndromes which lead to hypersusceptibility, including exposure to high levels of chemicals, nutritional deficiency, and genetic predisposal to environmental chemical sensitivities. Individual susceptibility is also influenced by age.

D. Sprague (1985) recently described the difficulties experienced by the residents of Deer Park, a suburb of Houston, Texas. The suburb was downwind from a company which had been contracted to dispose of PCBs by burning. The local media reported that people had suffered myriad effects from this exposure. Dr. Sprague treated three patients from Deer Park who were admitted as out-patients to the Environmental Health Centre in Dallas. These people had no prior allergic history or other signs of previously being sensitive to chemical exposures. All had become sensitive to a wide range of chemical exposures and Dr. Sprague states that there is no question in his mind that the onset of their difficulties coincided with the initiation of PCB burning. All three remained sufficiently chemically sensitive after medical treatment that they had to leave the urban environment of Houston entirely.

In setting standards for environmental contaminants, L. Plumlee (1979) says that regulators must be aware that high risk groups are not a small portion of the population. Rather, they include virtually everyone from time to time, due to differences in susceptibility for each pollutant, as well as variations with age and with different disease conditions. The total number of individuals in higher risk groups for exposure to low level combustion products of PCB incineration has not been addressed in the incineration proposals. To understand the possible order of magnitude, it could be assumed that the number is approximated by the number who are particularly vulnerable to tobacco smoke, also a complex combustion mix. N.E. Collishaw and co-workers (1984) estimated such a risk population to be in excess of 20% of the Canadian population, including persons with existing heart and respiratory diseases.

Not only have the effects of PCB exposures not been assessed with respect to these sensitive populations, but the effects of more common mixtures of combustion products, even wood smoke and domestic furnace exhaust, have not been assessed. Yet such products of combustion are known from clinical experience to elicit adverse reactions, often severe illness, in individuals who have less chemical tolerance than the bulk of the population (B.M. Small, 1983; W.J. Rea and co-workers, 1978). Since existing smokes and effluents from domestic and industrial sources are causing illness, it makes more sense to the Board of Education that methods should be found for cleaning up the present environment and reducing present illness, rather than adding not only more combustion in residential areas, but combustion of chemicals known to be highly toxic, which will not be burned fully in the incineration process, and which can only increase the amount of illness in the population of the City of Toronto.

Adverse Effects on Education

In addition to a lack of research on the health effects of mobile PCB destruction units in residential and school neighbourhoods, there has been insufficient study done to predict whether or to what extent the exhaust from mobile PCB destruction facilities will impact on education in adjacent schools.

Behavioural and learning effects which characterize reaction to low level chemical exposures by hypersensitive children are well documented. G. Fein and co-workers (1983) describe how subtle behavioral alteration can now be shown to be an early sign of chemical toxicity, and has provided evidence that particular chemical agents may produce long-term impairment in susceptible individuals. T.G. Randolph (1976), T. Damstra (1978), J. Pfeiffer (1975), A. Schauss (1980) and K.A. Blume (1976) all discuss central nervous system damage and consequent learning difficulties as a result of contact with various kinds of toxins in the home and school environments.

The entire subject of the effects of low level chemical exposures on education, from both indoor and outdoor sources, is presently under serious investigation by this Board and will be summarized in a final report to be presented to the Board at approximately the end of March, 1985. Our preliminary investigations, including briefs from teachers and parents, indicate that our school and staff population includes many more chemically sensitive individuals than had been previously assumed.

Conclusions (re burning of PCBs)

The Board does not agree with the use of mobile PCB destruction facilities within the City of Toronto as recommended by the Ministry of Environment.

Nor does the Board consider acceptable the alternative proposals by the City of Toronto Council and the Board of Health, that such facilities could be allowed if they are not located closer than 300 metres from anyone's home.

(These arbitrary distances are inadequate not only according to our arguments already presented, but in the event of accidental emissions of PCBs or other byproducts of incineration which could be emitted during inevitable episodes of incinerator malfunction. D.G. Ackerman and co-workers (1981) authored a report for the Environmental Protection Agency (U.S.) which recognizes the possibility of operational difficulties causing commercial thermal incineration units and high efficiency boilers to be sources of PCB contamination of the atmosphere.)

Recommendations

The Board of Education for the City of Toronto recommends:

1) that further assessment be made by the Ministries of Health and Environment of the potential health and performance effects of burning waste containing PCBs, either in mobile or stationary units, taking into account both the general population and those individuals who are particularly vulnerable to even low level chemical exposures;

2) that alternatives to mobile PCB destruction facilities in populated areas be investigated by the Ministry of Environment; and

3) that decisions on destruction methods be postponed until the health risks of all feasible alternatives are better quantified and the comparison is subject to further review by all potentially affected parties.

3.5 Communication About Pollution Problems

A number of the teachers, parents, and other interested people who wrote in or spoke at the public meetings referred to the difficulties they have had in being taken seriously about their health problems. Some felt that school officials, medical practitioners, government officials, and many others had been skeptical and would not accept either their interpretation of the problem or that of their family physician or medical specialist.

The evidence reviewed in the study has been more than sufficient for the members of the Pollution and Education Review Group of the Board of Education to accept that the problems people have identified are indeed very real. The Review Group has recommended in the following section that a fresh look be taken at the avenues through which parents, teachers, and other school staff can bring environmental problems to the Board's attention, to ensure that they are taken seriously in the future.

The Ministry of Health recently established a Committee on Environmental Hypersensitivity Disorders to investigate the kinds of phenomena that have been described in our literature summary and by parents, teachers, and others in Appendices A and B (Ontario Ministry of Health, 1984). The Committee is required to report on the current state of knowledge of environmental hypersensitivity, and to comment on the methods of diagnosis, the incidence, and the methods of treatment of such health problems. The committee members have been asked as well to outline prospective future approaches to investigation, treatment or research.

The Board of Education submitted a number of comments to Dr. George Thompson, Chairman of the Committee, early in 1985, which are reproduced below because of their relevance to the question of communication about and ultimately the proper solution of pollution and education problems.

1. Hypersensitivity can affect learning: It appears that environmental hypersensitivity disorders can and do influence many children's learning abilities and more generally, their educational experience. They can also adversely affect teachers.

2. Some school environments can affect hypersensitive individuals: It also appears that many environmental exposures which are now common in school environments, including dust, fumes from cleaners, art and science materials, etc. can aggravate symptoms in sensitive individuals.

3. Such individuals need to be identified and helped: If sensitized pupils are to receive an adequate education, they must be identified and receive adequate medical attention as well as suitable environmental conditions both at home and at school.

4. Knowledgable medical backup is required: The Board cannot fulfil its responsibilities for providing an education to hypersensitized individuals, unless there is adequate medical backup to provide diagnosis and treatment, and to prescribe the environmental conditions which may be necessary to enable a hypersensitive child (or teacher) to function normally.

5. Medical help must be accessible: It is the Board's understanding that knowledgable diagnosis and treatment of environmental hypersensitivity disorders is not widely available in Toronto, nor is it fully covered by the Provincial health insurance program. It follows that children whose parents cannot afford the specialized diagnosis and treatment do not have an equal chance at a good education and good health, as those who have greater means. The Toronto Board serves a large number of students from low income families. Many of these parents would not be financially able to pay for adequate treatment, if their child were identified as hypersensitive.

6. More hypersensitive children will be identified: The Board is presently investigating the effects of pollution on education. We can foresee further education of staff and parents, concerning the effects of pollutants, and of hypersensitivity disorders, on learning. This will in turn lead to identification of hypersensitive students who had not been previously identified.

Both this Board and the parents are in an awkward position, however, if our staff learns how to identify children who are exhibiting signs in the classroom that could be indicative of hypersensitivity, and there is little or no medical backup with which the parents can follow through.

7. Medical followup is needed to determine necessary environments: Our Board is also in an awkward position if there is insufficient medical followup or technology available to properly determine whether or how the school environment may be affecting individual students. Without this followup there is no objective basis for determining what alternative environmental conditions should be provided.

8. Efforts are required to reduce hypersensitivity: It is apparent that some hypersensitive individuals cannot tolerate even a small fraction of the levels of various gases commonly found inside most school or commercial buildings. If the Board may be required, under Bill 82, to provide special education environments for exceptional students, provisions for the most sensitive students could become prohibitively expensive. Research might be directed toward finding ways of reducing hypersensitivity to a level that can be managed by practical and economical environmental measures.

In a covering letter, the Director of Education summarized the Board's concerns by suggesting that it is vital that every effort be made to advance research in this field as quickly as possible. It is also important to make treatment for environmental hypersensitivity more widely available, and accessible to everyone through the provincial health insurance program.

It is the hope of the Pollution and Education Review Group that increased knowledge of people's reactions to chemical exposures, and increased understanding by others of what those affected have gone through, will come about following the release of the Ministry of Health's report.

4. RECOMMENDATIONS

The following sections contain the recommendations of the consultant and of the Pollution and Education Review Group to the Board of Education for the City of Toronto, as a result of this study.

Section 4.1 describes the general focus of the recommendations. Section 4.2 discusses each recommendation in detail, including the reasons why such actions are recommended. Section 4.3 lists the recommendations in summary form, for quick reference.

4.1 The Focus

The authors and the Pollution and Education Review Group suggest to the Board that although there are many gaps in the scientific evidence, there is more than enough scientific, practical and personal evidence to justify the Board's continuing attention to the effects of pollution on education in Toronto.

New developments may alter our detailed understanding of specific pollutants and their effects, but the overall pattern is becoming abundantly clear. Pollutants are present in our schools and our neighbourhoods. They can affect health and education. The Board must be involved.

We would like to suggest further that no benefit is to be gained by pointing fingers or laying blame for situations that have arisen in the past. Board and school staff will be the first to admit that insufficient attention may have been paid to pollution problems before, and that little information of the kind presented in this report has been available or had previously been sought.

Rather, what is more important is that the Board should act quickly to bring consideration of pollutants up to full status with the many other factors that affect children and staff in our schools. We suggest that the proper response to the information in this report is not an emergency one, but one in which new programs and habits must gradually become part of routine at all levels in the system, and particularly at the classroom level, where knowledgeable teachers, students and parents can detect early warning signs and help the Board to short-circuit potential problems.

The Board, for its part, must begin to be more receptive to feedback from teachers, parents and students. Pollution is just one of the many aspects of their environment with which people interact, and over the coming decades there will be much to learn about all aspects. If the Board creates ways of responding smoothly to new knowledge about education, health, and environment, the next round will be much easier than the last. In our present world it is the norm, rather than the exception, that new knowledge and new viewpoints must alter old assumptions.

The Toronto Board, however, is only one part of a large network of organizations that influence our lives and our children's lives. Many of these organizations - industry, local government, provincial and federal governments, scientific and educational organizations, other Boards of Education - could all be a useful part of a co-ordinated response to the problems discussed in this report. The Board must reach out to these other organizations, but it should expect in return reasonable co-operation and interest in problems that must concern all of us. This is particularly important where jurisdictions and responsibilities place the power to act in the hands of such bodies.

The immediate focus, of course, must be toward the individuals whose health, education, or working experience have already been badly affected by exposure to pollutants either within Toronto schools or in nearby neighbourhoods. The authors and the Pollution and Education Review Group strongly suggest that detailed followup work must be done to address the specific problems that many individuals are having now, every day, in Toronto schools. In the course of doing so, it is hoped that Board and school staff will build an expertise in trouble-shooting pollution and education problems that will become the basis for prevention in the future.

Some time will be required to help staff, parents, and students become better informed, and to develop new methods of working together to solve environmentally-related problems. It is more likely that individual problems will be solved if a joint effort can be achieved, in which both Board staff and parents or students take appropriate responsibilities and are suitably responsive to and patient with each other. Many of the environmental problems that are cited in various sections of this report will require careful detective work, and a number of rounds of adjustment and re-evaluation may be required in individual cases before satisfactory solutions are achieved.

4.2 Detailed Recommendations and Discussion

RECOMMENDATION 1a (Determine School-safe Materials and Activities):

> **That procedures should be established by the Director of Education for evaluating pollutants emitted by materials and activities within Toronto schools, and that minimizing pollutant exposure shall be included as an important criterion in the selection and purchase of school-safe materials, and in carrying out maintenance or educational activities within schools.**

RECOMMENDATION 1b (Find Alternative Renovation Schedules and Materials):

> **That renovation schedules and procedures for Toronto schools, especially painting inside the schools, be re-examined by September 1985 to determine alternate ways of accomplishing renovations without exposing staff and students to undue levels of indoor pollutants.**
>
> **That extra precautions such as increased ventilation, isolation, and air filtering be undertaken where possible during any interim renovations, while longer-term revisions in procedures are devised, and that the Board continue its present new policy of suspending all painting in any school where one or more students are known to be sensitive to trace levels of chemicals.**
>
> **That extra precautions be taken in schools in areas of higher outdoor pollution to insure that renovation and maintenance procedures in such schools do not add to the overall pollution load borne by the staff and students.**

Conversion to "school-safe" materials and activities will take considerable time. The Board has already initiated a procedure to investigate alternative materials and installation methods for floor coverings. These procedures can be extended gradually to cover all school materials. The goal is to find, or stimulate manufacturers to provide, materials which meet a much more stringent standard of safety and low emissions.

The Board will need help from maintenance staff as well as from teachers involved in art, science, industrial training and other activities, to review present practices and where necessary choose better materials or design suitable methods which will avoid the risk of health problems, particularly for individuals who have already become sensitive to environmental exposures.

Feedback from teachers and parents during this study demonstrated clearly that painting and other renovation activities within Toronto schools have been associated not only with discomfort but in some cases with severe and continuing illness. Many more precautions than are now being taken may be necessary to protect students and staff from sensitization or from aggravation of existing sensitivities. This problem requires high priority attention. (For further details see Section 3.3: "Maintenance, Painting and Renovation").

RECOMMENDATION 2a (Establish Trouble-Shooting Group:

> **That the Director of Education shall establish a "trouble-shooting" group of technical staff to investigate and solve the specific pollution problems in Toronto schools that were raised or are raised as a result of this study.**
>
> **That at the end of 1985, this technical group shall publish a detailed manual on trouble-shooting procedures for investigating suspected incidents of pollution or other environmental irritation in school environments.**
>
> **That the Director of Education shall make a full report to the Board at the end of 1985 on the experience gained, including successes and failures, in addressing specific pollution problems in Toronto schools.**

RECOMMENDATION 2b (Designate Environmental Study Schools):

> **That the technical group so formed shall designate at least one public school (e.g. Withrow Public School, Wilkinson Public School) and at least one secondary school (e.g. West Toronto Secondary School) as experimental schools for the purposes of developing trouble-shooting procedures and means of lowering overall pollution levels inside Toronto schools.**

It is critically important that the Toronto Board develop the skills necessary to successfully "trouble-shoot" problems that are suspected to be related to the school environment. This report has offered a new perspective on health incidents — namely that existing standards for pollution exposure do not adequately address the kinds of sensitivity to chemical and other exposures that appear to be present within the Toronto school population. Traditional methods which involve comparison of standard measurements with expected toxic levels have not always pinpointed the causes of illness and enabled them to be removed or otherwise dealt with.

Procedures for trouble-shooting will require a combination of traditional approaches and a new emphasis on obtaining more information from the individuals who are reporting health problems or discomfort. As much attention is needed to potential sources of pollution or irritation inside a building as to general ventilation and air handling. Such investigations must be open to all clues available, even if observations do not appear to match present theories (e.g. some people do react badly under fluorescent lighting).

Fixing environments where sensitivity reactions appear to be occurring resembles a detective investigation rather than an assembly line inspection - each case is different and often the cause of the problem is not what you might have expected. Such skills will require experimentation, practice, trial and error — and time — to develop. Once developed, this experience and ability could pay for itself in short order by avoiding both the adverse effects that pollution can cause, and the tremendous loss of time and resources that can be spent arguing over problems without solving them.

RECOMMENDATION 3a (Implement New Ways of Getting Feedback):

> **That the Director of Education shall set up new procedures for receiving information from staff, students and parents about suspected environmental problems in Toronto schools.**
>
> **That such procedures allow individuals a full and immediate hearing at the level of their choice (e.g. school office, area office, or board office), on a confidential basis, and in such a way that people need not fear that their position is jeopardized by speaking up.**
>
> **That records shall be kept (but names protected) in such a way that the cumulative experience of receiving and acting on such information can be available to guide board staff in the solution of future incidents, or prevention of pollution problems, in Toronto schools.**

RECOMMENDATION 3b (Carry out Followup Interviews with Respondents):

> **That the Director of Education shall, through the Trouble-Shooting Group or other means, carry out follow-up interviews with persons who responded to the Board's call for information during this study program, with a view to gathering sufficient information to assist the technical group to address and correct, within its capability, whatever problems have been reported.**

If this study is to have been worthwhile, it is very important that the Board follow up on and solve specific problems that have been brought to its attention during this study. The technical group described in Recommendation 2 must respond to this challenge and help staff, parents and students gain confidence that something can be done when problems arise.

In so doing, it is important that the Board establish ways of receiving further comments about the school environment, and ways of responding to staff, parents and students about them, that will continue to serve them well in the future.

Because little is generally known about the kinds of effects that even low-level chemical exposures can have, people who have experienced problems have sometimes faced skepticism from their associates, school officials, board officials, health professionals, and even their close friends and families.

Attitudes cannot be expected to change overnight. But the Board should offer more ways for getting the message across, to people who will have better access to information and training about such problems (see also Recommendation 4). And the Board should offer the assurance that no teacher's job will be jeopardized and that no student will be unfairly treated in school as a result of their speaking out about environmental problems in the schools.

RECOMMENDATION 4a (Increase Awareness Through to the Classroom Level):

> **That the Board of Education shall adopt the policy that proper solution or prevention of environmental problems within schools requires knowledgeable observation and participation by many individuals from the board level right through to the individual classroom.**
>
> **That the Board shall therefore work toward increasing awareness at all levels that pollution can affect the health, learning, or teaching experiences of students and staff, and that measures can be taken to improve classroom environments. (see also Recommendation #8)**

RECOMMENDATION 4b (Prepare Educational Materials to Increase Awareness):

> **That the Director of Education shall establish a program for preparing appropriate learning materials for application at different levels within the system, including, if deemed appropriate, brochures, manuals, notes, slides, audio or video tapes, films, displays or other material.**
>
> **That the Director of Education shall begin an experimental program to increase awareness of the potential effects of pollutants in the classroom, and report to the Board before the end of 1985 on the most suitable methods for continuing an awareness program in the long term. Such programs should take care to maintain a perspective, acknowledging that pollution is one factor among many that can affect learning.**

One of the most important conclusions arising from the present study is that pollution problems cannot be solved centrally. The nature of people's individual reactions to odours requires alertness and co-operation at every level from the board office through to the classroom.

Many school officials, teachers, students and parents are already fully knowledgeable about the effects of pollutants, through personal experience. Many others who have not had to deal directly with such problems may be reading about them for the first time in this report, perhaps with some surprise.

The more people there are who have a working knowledge about sources and effects of pollution and other environmental factors, the more likely it is that such problems will be recognized early or prevented in future.

At the same time, the Board must recognize that many of its staff already feel overworked, and such new information and skills might be seen as just one additional burden that may not be particularly welcome. For this reason, it is important that suitable educational material be developed and tested over the coming months, which will deliver the knowledge and skills that are needed in a concise and practical form.

RECOMMENDATION 5a (Upgrade Board's Pollution Measuring Capability):

> **That the Director of Education shall prepare recommendations before the end of 1985, if deemed necessary, for the acquisition of upgraded pollution measuring equipment and/or services that would support a long term program to maintain acceptable air quality and other environmental conditions in all Toronto schools.**

RECOMMENDATION 5b (Consult with Measurement Experts re Strategy):

> **That the Director of Education shall obtain the advice of experts in the field of pollution measurement technology and investigative procedures, in order to develop an appropriate measurement strategy and capability to aid in the solution or prevention of pollution problems in Toronto schools, bearing in mind particularly:**
>
> **1. ways of minimizing the cost of special investigations and therefore maximizing resources available for any physical modifications deemed necessary to solve a problem;**
>
> **2. ways of taking into account the varying degrees of individual susceptibility to pollutants on the part of students and staff;**
>
> **3. ways of using information and resources which are or could be made available within each school, to track down and solve local pollution problems without intervention by Board or outside personnel.**

The Board has an active and well-equipped occupational health and safety office and has for some time used measurement devices for determining such things as temperature, humidity, carbon dioxide content, and the presence of noxious gases in the indoor environment. These will continue to be required in the investigation of pollution complaints.

With the advance of technology and information in both the measurement sciences and in the medical aspects of sensitivity to pollutants, however, it is advisable to review the Board's present measuring capabilities and procedures.

There is considerable variation among measurement strategies and investigative procedures used by others in industrial, commercial and residential situations. The choice of equipment and methods for school environments need not match the choice for other situations. Expert advice should be sought to devise a strategy that will allow quick action when a problem is reported, at reasonable cost.

The human being may be the most acute detector of all of potential problems, and should be an important part of any measurement strategy. While it is not advisable to turn people into guinea pigs, people's own perceptions about the environment may often provide the best clues for solving problems.

RECOMMENDATION 6a (Provide Experimental Low-Pollution Classrooms):

> **That the Director of Education shall explore the feasibility of establishing special low-pollution classrooms in appropriate locations in the system, to aid teachers and students who may be particularly susceptibile to low-level pollutants, and to assist teachers in testing and choosing environments which may be most suitable for students with learning, behavioural or other problems.**

RECOMMENDATION 6b (Study Need and Recommend Locations for Clean Rooms):

> **That the Director of Education shall analyze information gathered in the present study, experience gained by the Trouble-shooting Group, and data from other Board resources, to determine the number of students and staff who might benefit from such facilities, the number of classrooms or other facilities required, the best locations for, and the estimated cost of equipping special low-pollution classrooms.**
>
> **That the Director of Education shall co-ordinate such activities with the Pollution and Education Review Group so that appropriate types and levels of funding may be sought from outside sources (see also Recommendation 9c).**

The Board must very seriously examine its responsibilities for providing suitable educational and workplace environments for its students and staff. It is clear from the respondents in the present study that the Toronto student and teaching populations include people who are very sensitive to chemical exposures. In some cases these sensitivities were present before entering the school system; in others they arose subsequent to entering it, or are apparent only when the person is actually in a school building.

The Waterloo County Board of Education has led the way by providing an experimental low-pollution classroom for the elementary school level. A Kitchener, Ontario high school principal is also preparing such a classroom for the secondary school level (Toronto Star, March 27, 1985, and Globe and Mail, Toronto, May 7, 1985). Similar classrooms could benefit Toronto, by:

- o helping students and staff who may still experience discomfort despite efforts to 'clean up' standard classrooms;
- o providing a testing environment to help determine what pollutant sources in the school may be bothering people
- o helping determine whether children with learning and behavioural problems might be helped by a cleaner environment.

Some research may be required to determine the most practical and economical ways of providing such facilities when they are necessary. (In some cases, students can be desensitized to the existing school environment, if some precautions are taken to reduce general chemical exposures.) Because of the potential benefit to other boards and to education research in general, Provincial funding would be appropriate (see Recommendation 9c).

RECOMMENDATION 7a (Discourage All Smoking in Schools):

> **That the Board should adopt a policy of discouraging all smoking in schools, with an ultimate goal of designating all schools as smoke-free environments.**

RECOMMENDATION 7b (Designate Experimental No-smoking Schools):

> **That the Board should consider the possibility of designating several schools as no-smoking or smoking-restricted schools. Schools so designated could be chosen on the basis of the willingness of office and teaching staff to participate in such an experiment.**

It is clear from a considerable weight of evidence that tobacco smoking carries serious risks both for the smoker and for persons who breathe second-hand smoke. Tobacco smoke is also a common offender in cases of allergy or hypersensitivity. If the Board is serious about improving the quality of the indoor environment, the issue of tobacco smoking, no matter how emotionally charged, cannot be ignored.

A school is considerably different from an industrial or commercial establishment, because students for the most part have little choice regarding attendance in school. If the school environment is detrimental to a student's health, he or she has little immediate recourse. Since the Board of Education acts in effect as guardian of the health and safety of students during their school hours, it is important that the Board take all reasonable steps to avoid unnecessary risks to the health of students.

Both parents and teachers have advised the Board that tobacco smoking in the schools has had serious detrimental effects on health and comfort. Whether by staff in staffrooms, offices and custodial rooms, or by students in washrooms, smoke contaminates the rooms where it originates and circulates through air ducts to other parts of a school. Its general importance relative to other pollutants has not been properly evaluated. But its effect on individual cases is clear - it makes some people sick.

The answer in many such complex issues is to start small and show the way. If there are sufficient numbers of school staff (both smokers and non-smokers) within the system who are willing to participate in an experiment to designate one or more schools as totally non-smoking, this should be done. Since abrupt changes in general policy may be seen as being just as discriminatory toward smokers as unwanted exposure to smoke may seem to non-smokers, it may be necessary in the short term to explore imaginative new ways of restricting the contamination of general school air caused by recirculation of air from designated smoking areas.

RECOMMENDATION 8a (Explore the Role of the Internal and External Environment in Chronic Learning Problems):

> **That the Board shall continue its investigation of the relationship between pollution and education by, among other activities, exploring the role of the internal and external environment in long-term chronic learning problems in children.**

RECOMMENDATION 8b (Establish a Study Group to List Priorities and Map out Long-Term Opportunities):

> **That the Director of Education shall establish a small study group of appropriate board officials and others knowledgeable in this field, to advise on an appropriate list of priorities, and to develop a long term plan for exploring and implementing new knowledge in this area.**
>
> **That the plan so developed shall address, among other issues, the question of appropriate physical or medical testing which would help to determine what role, if any, the internal and external environment is playing in an individual's learning problems.**

There is sufficient information now in the scientific literature and in the form of practical and clinical experience, to warrant a serious exploration of the connection between chronic learning disabilities, underachievement, behaviour problems, etc., and the internal and external physical environments of children.

That is, in some cases, pollution in the air children breathe, in the food they eat, and in the water they drink, as well as many other nutritional and allergic factors, may play a strong role in the difficulties they experience. Adequate medical and technological backup will be necessary to confirm whether there is any connection in individual cases (e.g. ability to measure heavy metal intake, pesticide or volatile hydrocarbon exposure, nutritional status, and reactions to specific environmental exposures or foods).

Conventional approaches to behaviour and special education may benefit by inclusion of such additional considerations. Special low-pollution environments designed to help students with hypersensitivity to chemical exposures may also provide a testing environment to determine whether students with learning or behavioural problems might also benefit by lower pollution levels.

Inclusion of environmental factors in professional training and in parent and student education could also help a great deal to determine the extent to which the physical environment may cause or aggravate chronic behaviour and learning problems.

While the present study has documented some of the possible effects of contamination with lead and other heavy metals, it has only touched upon the complex internal environment of a child and its possible effects on the brain. A more complete study of this area is essential.

RECOMMENDATION 9a (Mandate the Pollution and Education Review Group to Approach Outside Organizations):

> **That the Pollution and Education Review Group be charged with the task of approaching and/or preparing a position with which the Board may approach a number of outside organizations in order to encourage action by others which would beneficially affect the school environment.**

RECOMMENDATION 9b (Approach Other Boards re Joint Action):

> **That the Pollution and Education Review Group and/or the Board shall approach the Association of Large School Boards of Ontario (ALSBO) about possible joint efforts by the large school boards in encouraging action by others regarding pollution and education.**
>
> **That the Pollution and Education Review Group shall meet with representatives of the Metropolitan Toronto Separate School Board and other interested Boards to discuss joint efforts and areas of mutual concern in encouraging action by others regarding pollution and education.**

When the present study was initiated, the Trustees of the Toronto Board of Education recognized that they needed more background information and a more complete understanding of the effects of pollution on education. They recognized that much could be done within the school system, but that at the same time a great deal of action was required by others to address environmental problems that affected Toronto children.

This report provides the needed basis for continuing present discussions with outside agencies in earnest, as well as an incentive for initiating new contacts at many levels. Pollution from many sources can adversely affect health and education. Present standards do not appear to address many of the incidents that have occurred in the Toronto school system. New research, new initiatives, and greater co-operation will be required to address this new information. The Board of Education for the City of Toronto has neither the mandate nor the resources to tackle many aspects of these problems. It can, however, extend its co-operation to those who have.

Now is also the time to renew connections and discussions with other organizations having similar interests, and particularly other school boards in Ontario. A tight research schedule did not permit the kinds of liaison with other boards that would have been helpful during this study. Circulation of the report to them and subsequent discussions both individually and through joint organizations will likely reveal many mutual interests on pollution matters. Joint approaches to other agencies such as Provincial and Federal departments may be particularly desirable and effective in stimulating needed actions.

RECOMMENDATION 9c (Approach Other Government Levels re Funding):

> **That the Board of Education shall approach the Ontario Minister of Education about Provincial Funding for Special Experimental Low-Pollution Classrooms in Toronto Schools and about funding for research into educational performance standards which would help in the testing of the effects of pollutants on people.**
>
> **That the Board of Education shall approach appropriate Federal Government departments and agencies, standards organizations or other organizations about financial and technical assistance in testing products in order to find "schoolsafe" materials.**

This report leaves the Toronto Board of Education in a position it had hoped it would avoid by following traditional methods of assessment or acceptance of materials and procedures used in its schools. Instead, it finds that many materials and practices hitherto considered safe are affecting the health of some of the students and staff in Toronto schools. It finds that some people may have adverse behaviour and learning effects from low-level chemical exposures, and that products are rarely if ever assessed by screening agencies for such effects.

Many decades of research will likely be required to bring us to a point of full confidence in the proper use and control of "twentieth-century chemicals" in our environment. This research is not the responsibility of a local board of education.

At the same time, the Toronto Board requires answers in the immediate term which will help it to protect the health and safety of students and staff, and to avoid in the immediate future the kinds of problems that are discussed in this report.

It is therefore appropriate and desirable for the Board to seek outside funding for many of the measures that may be necessary in order to reduce adverse effects of pollution on education. While these measures will indeed benefit people in the Toronto school system, the knowledge gained by them could benefit many people in many other situations. Both Provincial and Federal funding should be explored.

RECOMMENDATION 9d (Encourage Action by Government Agencies):

> **That the Board of Education should continue to encourage the Toronto Board of Health to carry out appropriate investigations to determine definitively the cause of illnesses and the role of outdoor pollutants in the health of people living in or near the Junction Triangle and other higher pollution areas of Toronto.**
>
> **That the Board of Education shall continue to encourage the Ontario Ministry of Environment to require a reduction in industrial pollution in the Junction Triangle and other higher pollution areas of Toronto as well as in Toronto generally.**
>
> **That the Board of Education should encourage the Ontario Ministry of the Environment and Environment Canada to adopt pollution standards for food, water and air which account for the wide range of vulnerability in residential populations, the effects of pollutants on particularly sensitive individuals, and the behavioural and learning effects of chronic exposure to low levels of outdoor pollutants.**
>
> **That the Board of Education shall encourage the Ontario Ministry of Health to fund more research and medical education as well as community health centre support, for the diagnosis and treatment of chronic sensitivity to low-level chemical exposures.**
>
> **That the Board of Education shall encourage the Federal Department of National Health and Welfare, the Department of Consumer and Corporate Affairs, and the Provincial Ministries of Health and Labour, to develop indoor air quality and product guidelines suitable for children in educational environments, and which take into account sensitivities to low level pollutant exposures and educational effects of such exposures.**

Many specific issues need followup effort by other agencies. Some of these agencies are already investigating these matters. It is, however, important that the Toronto Board and perhaps other Boards make their views and needs clearly known with respect to pollution and education.

A number of the issues cited above have already been raised by the Board during the course of this study, in particular the determination of causes of illness and reduction of pollution load in the Junction Triangle area, as well as the development of better medical backup in Ontario for diagnosing and treating environmentally-related health problems.

These issues require restatement in light of the information presented in this report, with a hope that the next step will be serious discussions about action that can be taken. The Board should also emphasize its willingness to co-operate within the extent of its own mandate and resources, in addressing these issues.

RECOMMENDATION 9e (Encourage Further Research by Others):

> **That the Board of Education shall approach and encourage research organizations (e.g. OISE) to develop educational performance standards for testing the effects of pollutants on people.**
>
> **That the Board of Education shall approach and encourage industry representatives, both directly and through the Board's tendering and purchasing practices, to develop and test "schoolsafe" products to meet such standards.**

Many other agencies are equipped to undertake research activities that could help to solve the problems and maximize the opportunities presented in this report. Some are already well endowed with the resources to carry out what is needed. Others may require help to motivate funding agencies to underwrite the research.

This report has called for a search for "school-safe" materials and practices upon which the Board could rely in future without fear of causing adverse health and educational effects. Yet the means for determining what is "school-safe" and what is not are ill-defined right now. More precise criteria are needed so that those purchasing materials and designing school activities can make effective decisions.

Subtle changes in educational performance may provide easy ways of screening different environments for their suitability. Organizations such as university research departments, including the Ontario Institute for Studies in Education, may be best suited to develop the needed protocols for testing the educational effects of pollutants on people. To date their will to work in this area has been stronger than the funding available. An alliance of their expertise with the Toronto Board's urgent need for research results might carry sufficient weight with funding agencies to get such work started.

The chemical industry is often tagged as a villain by many who have researched environmental problems. It is important that the Board recognize industry and its research capability as allies in addressing the problems we have discussed. More detailed specifications of what this Board and other Boards need, direct co-operation in assessing the effects of existing and new products, and simple market power in the tendering and selection process can help to stimulate industry to design, test, and produce products that are particularly suited to the school environment.

RECOMMENDATION 10 (Prepare a Detailed Implementation Plan and Budget):

> **That the Director of Education shall prepare a detailed implementation plan and a budget, including some re-allocation within the 1985 budget, to initiate the actions described in Recommendations 1 to 9.**

The Pollution and Education Review Group acknowledges that these recommendations come partway through the Board's fiscal year, and that the total budget has therefore already been set for 1985. It will be necessary to prepare a detailed implementation plan which allocates sufficient staff and other resources within the 1985 program and for the coming year, to properly address pollution considerations.

Particular attention should be paid by staff to methods of structuring these programs, and in turn, to methods for reducing pollutant levels in problem areas within the school system, which might be accomplished with minimal additional expenditure, and possibly even cost savings. Achieving lower indoor pollution levels can sometimes be a matter of reducing the number or changing the type of materials in the schools. Special low-pollution classrooms, for example, may be achieved by not painting the walls, and not purchasing and installing carpet.

In the long run, it might be expected that considerable savings could be achieved by minimizing adverse educational effects related to pollution, and thereby reducing the special education load. At this stage it is far too early to speculate, and it must be recognized that considerable effort, much staff time, and many reallocations of expenditures will be required in the short term before measurable benefits may be seen, either in the health and abilities of staff and students, or in long-term education costs.

4.3 Summary of Recommendations

1. **Determine School-safe Materials and Activities, and Find Alternative Schedules for Painting and Renovating**
2. **Establish a Trouble-Shooting Group of Technical Staff to Solve Pollution Problems, and Designate Environmental Study Schools for Establishing Procedures**
3. **Implement New Ways of Getting Feedback, and Carry out Followup Interviews with Respondents To Help Solve Problems**
4. **Increase Awareness of the Effects of Pollution Through to the Classroom Level, Starting by Preparing Learning Materials**
5. **Upgrade the Board's Pollution Measuring Capability, Starting by Consulting with Experts on an Economical Strategy**
6. **Provide Experimental Low-Pollution Classrooms, Starting With Studying the Need and Recommending Locations**
7. **Discourage All Smoking in Schools, Starting by Designating Some Experimental No-smoking Schools**
8. **Explore the Role of the Internal and External Environment in Chronic Learning Problems, Starting by Establishing a Study Group**
9. **Mandate the Board's Pollution and Education Review Group to Approach Outside Organizations Regarding Pollution, Starting By:**
    - **Approaching Other Boards re Joint Action**
    - **Approaching Other Government Levels re Funding**
    - **Encouraging Action by Government Agencies, Including Development of Air Quality Guidelines Suitable for Children in Schools**
    - **Encouraging Further Research by Others**
10. **Prepare a Detailed Implementation and Financing Plan, including Reallocation Within the 1985 Program, to Initiate the Above Actions.**

APPENDIX A

APPENDIX A
DETAILED SUMMARY OF PUBLIC MEETINGS

The following pages document testimony given by parents and teachers at two public meetings held in February 1985 by the Board of Education for the City of Toronto, to hear people's experiences regarding pollution and education.

This summary was prepared from detailed notes and tape recordings made of the two meetings. Names of the speakers have not been included since they were not required to identify themselves before relating their experiences. Every attempt has been made to include all of the points made by the speakers. Editing has been confined to placing the testimony in the form of a third person narrative of the events of the meeting.

a. Public Meeting, Feb. 12/85 - Bloor Collegiate Institute

SPEAKER #1

A woman who spoke about painting in the schools had a daughter in grade 12 at North Toronto Collegiate and a son in grade 9 at Glenview School. She blamed painting in both of her children's schools for their current state of illness.

In the daughter's case, the illness began, along with the painting, in September. She had a cold for three weeks after school began, after which she experienced exhaustion and headaches. The mother described how this fatigue continued intermittently during the time the painting was in process, accompanied by dizziness, headaches, and swollen fingers. The symptoms would appear after spending five minutes in the school building, subside after a weekend at home, then reappear once the child returned to school.

The girl had formerly been an excellent student, receiving high marks and participating in many school activities. Now her marks are close to the pass level and she has great difficulty concentrating. She experiences problems with the air in the school washroom which is polluted with cigarette smoke and hair cosmetics. In the classroom, the smell of paper reproduced by means of ditto copiers causes her to have difficulty thinking and leaves her feeling confused. Floor cleaners and disinfectants, especially those used in the school cafeteria, create similar problems for this student. The cigarette smoke that leaks into hallways from staff rooms causes her to be sick to her stomach and faint.

The woman who spoke felt that the staff at the school did not demonstrate an understanding of the problem. She said that her daughter feels isolated but meets many other kids who say they have the same problems. She uses a charcoal filter mask at school now to avoid some of the worst exposures to chemicals.

The painting at Glenview School began about the middle or end of January. During the first week, the boy who attended classes there began to feel ill. He returned home from school on the second day of the painting with yellow/green skin and black circles under his eyes. He lost his voice, felt dizzy and became withdrawn and tired, sleeping round the clock for the rest of the week.

The parents had, prior to the start of the painting, received a form letter from the Board of Education saying that the bulk of the painting would be done after 3 p.m. When the boy's father visited the school at around 1:30 p.m. to discuss his son's illness, painting was in progress. Windows were closed, classroom doors open and the father reported that the smell of paint was very strong.

The boy got well after a week at home, spent three days at school, then experienced the same symptoms and spent another period of time at home. Apparently many other students were also affected by the paint fumes and the boy reported seeing unusually full absentee lists in the school office during the time the painting was in progress.

Neither child had, in the past, reacted to having painting done in the home. But the mother said that it hadn't been done in winter nor with windows closed, as had been the case during the school exposure situation.

She feels that children deserve an optimally clean environment where they can work and learn easily, without parents being required to lessen their children's chemical exposures so they can survive the onslaught of the school environment. She also thinks that children with such sensitivities are becoming less rare.

SPEAKER #2

This woman, who lives in Mississauga, has a seven year old son who has been in school for three years. He has diagnosed allergies to a variety of foods and chemicals. Often at school he experiences difficulty concentrating, has a short attention span and displays behaviour unacceptable to the teacher. Widely different results come from testing done with the boy in the middle of the week compared to the same test done on a Monday. He appears to be able to do his school work much better at home than in the school environment and his performance at school is markedly improved after the Christmas and summer holiday periods, only to again deteriorate after a few days at school.

Newsprint, paints, markers, and the smell from a laminating machine have all caused him specific problems. His allergic condition has been presented to his teacher at the beginning of each school year. But according to the mother, his teacher does not understand that his behaviour changes dramatically in relation to his exposure to foods and/or chemicals, instead believing that, since psychological testing has proven the boy to be "average", he should be performing at a higher level. She allows him to use crayons, but sits him in the middle of a circle of other children who are using markers and paints, causing him to be exposed to the smells anyway.

The mother is investigating filters, etc. that could be used in the school in order to lessen the child's chemical exposures. She has been told by one of her son's special teachers that her case load of these learning disabled children has been increasing and that since her son is "borderline", she just doesn't have adequate time to deal with him. She reported that someone from the Association for Children With Learning Disabilities told her that the connection has been made between allergies and learning disabilities.

SPEAKER #3

The speaker's daughter attends grade 5 at Bedford Park School. In grade 3 she began to be sleepy in the classroom, unable to concentrate, sensitive to light and loud noises, and experienced memory loss. Her doctor treated her for epilepsy and the drug he administered stopped the seizures but increased her allergies. Her hyperactivity and inability to concentrate continued while she was in school, but subsided during the summer vacation. Her handwriting was good early in the week but deteriorated as the week progressed. Once after being moved from a reading clinic in a dusty and musty classroom, her reading improved remarkably.

She has subsequently been tested and has a number of chemical and food sensitivities, including dust and moulds. During art periods, glues and felt markers cause her problems. Plants in the classrooms, perfume and cigarette smoke lingering on a teacher's clothes, and newly cleaned carpets have all caused her symptoms to appear while at school.

The speaker feels that many teachers don't yet understand the problem. In one instance, the student was taken to a classroom past an area where painting was in progress and the caretaker's cleaning supplies were stored, to do a reading test on which she scored poorly.

The girl is receiving treatment for her sensitivities and is now able to tolerate more chemicals and foods than she previously could. The treatment is partly aimed at reducing her total load of chemicals in order to help her cope better with the ones to which she is particularly sensitive. The family has stripped their home of chemicals. The girl has been moved to a new bedroom to avoid the carpet and underlay, which were two years old at the time she got sick, her foam mattress and curtains, to all of which she reacted. Smoking has been banned from the house and her bedroom door remains always closed.

Her walking route to school has been carefully chosen to avoid as much automobile pollution as possible, but exhaust fumes from school buses idling at the school's front door seeps into her classroom, causing her to be sick.

This same woman has another daughter in grade 13 at Lawrence Park Collegiate. This girl has always received good marks in school and does not have a history of allergies or illness. She has, since October 1984, experienced unusual illness which, according to her mother, is due directly to painting which has been in progress at the school since September.

Beginning in October, the girl has felt sick at school, has experienced headaches and inability to concentrate, developed food allergies, and changed from a vivacious, bright teenager into a tired, pale shadow. Her marks are down 20% from the previous year, possibly due to the fact that she experienced great difficulty concentrating during her pre-Christmas exams, at which time painting was in progress. When she was allowed to rewrite a calculus test (which she had barely passed) in a less smelly room, her mark improved by about twenty points.

The mother described an incident that occurred in a chemistry class. Apparently there was some trouble lighting the bunsen burners and some gas escaped into the room. The girl turned grey and fainted. She was carried out of the room by her fellow students, revived, and walked home with no medical attention. She stayed home for two weeks, pale and sleeping almost constantly. She also experienced nausea, aching joints and dizziness.

During biology class, she reacts to the formaldehyde used when dissecting rats, to which she has been diagnosed as being sensitive. Even though the teacher now moves the substance to an adjoining room, it still bothers her.

Once during art class, a supply teacher made the students clean the brushes with varsol. When the fumes bothered the student and she asked permission to leave the room, the teacher refused, and the girl spent a few days at home recovering.

The mother perceives the school staff as trying to be helpful but not understanding the sensitivity problem. The teachers have told her that they have all been ill during the painting of the school and have had to go home at least once.

The student is now equipped with a charcoal mask that she takes to school and an oxygen tank at home that can be transported to school if necessary.

The same family has a third daughter who attends grade 8 at Glenview school. She is a bubbly, lively child with no prior allergy problems. When they began painting at her school about the middle of January, she experienced a similar set of symptoms to those previously described. Her skin became a grey colour, circles appeared under her eyes, her body temperature fluctuated widely from hot to cold, and once she fell asleep at her desk.

She improves at home on weekends except that her energy level has not returned to normal. After one or two days back at school, she deteriorates again. When the family goes out of town skiing on the weekends, she is even better, according to her mother. The mother is afraid that this is a long term problem, that her daughter has become hypersensitive due to the paint exposure.

She feels that the school staff needs educating about the chemical pollution problem. For instance, all three of these girls attend schools in which swimming pools are located. Fatigue and headaches are experienced after swimming and the girls are excused from swimming class. When excused, they must sit at the side of the pool and await the end of the class, exposing them to the chlorine fumes to which they are sensitive.

She is also concerned about the use of cleaning supplies and pesticides on a regular basis in schools. She feels that teachers should be able to look for and recognize sensitivity problems and says she is able to recognize evidence of the problem in other children. Some symptoms that she looks for are lack of concentration, paleness with circles under the eyes, chronic tiredness or hyperactivity, letter and word reversals, and dexterity problems evidenced by poor motor skills and dramatic handwriting changes.

She says that reactions to the following foods could also cause these symptoms: corn, wheat, beef and egg; milk allergy causes stuffiness and hearing problems. Her daughters have been tested as sensitive to food additives and preservatives which she says can cause hyperactivity. She stated that her daughters are sensitive to a smaller number of foods at home during the summer months than during the school term, possibly indicating a lessened load of chemicals during the vacation from the school environment.

This speaker suggested that a study be done on school performance of students before and during painting at the school if that is what is necessary to have the painting stopped.

SPEAKER #4

A teacher at High Park Alternative School expressed the concern of a number of parents of children at her school about an unusually high number of students who have experienced sore throats and been on antibiotics. Two reasons for this were suggested: the school's proximity to the Junction Triangle and its outdoor air pollution and the actual classroom environment and its possibly polluted air.

Prior to the previous school year, she and the children moved into a newly renovated classroom. The ceiling had been lowered, a wall had been moved, new carpeting was laid, new fluorescent lights and shelves had been installed. After moving into that room, the teacher and other parents experienced sinus problems and throat irritation, and the children began to have sore throats and many were prescribed antibiotics. The symptoms are not as pronounced during this school year.

One child in particular was of concern to this teacher. She was on antibiotics for a full year after being in the class, due to a recurring throat infection. The infection cleared up during the summer vacation but reappeared during the school year. The child was recently diagnosed as having learning disabilities, but the teacher is not sure if the two things are connected. The family has since moved to the country.

The teacher said that she often turns off the fluorescent lights because they give her headaches and make her feel unduly tired. She also expressed some concern about the comfort level at the school, saying that her classroom is often 75 degrees F while the office right down the hall has a temperature of 68 degrees F. The excessive heat makes both her and the children constantly thirsty and lowers their energy level.

She said that the teaching staff needs to be educated about chemical pollution in the school and its effects and should have a means of following up on problems. She expressed concern about the materials used in the renovation of her classroom and about the school board's planning for pesticide use and painting.

As an example she cited a situation in her own school. A previously empty classroom was designated, before the Christmas break, to be used for a primary special education program. Instead of the necessary renovations being scheduled for the holiday period, they were done while school was in session and the rest of the school was exposed to the fumes from the glue used to lay the new carpet.

b. Public Meeting, Feb. 26/85 - Riverdale Collegiate

SPEAKER #1

The first speaker was a chemically sensitive woman who has been a primary teacher in the city for 11 years. She is a resident of Ward's Island and is currently on study leave from the Board of Education. Most of her teaching has been done in the Bathurst, Spadina, College, and King Street areas, with a period at the Toronto Island school as well.

Her health problems began subtly, with early vague complaints such as fatigue, headaches and back pain. Six years ago she was off work for three months with a lower back problem. During summer vacations in Newfoundland she felt much better and experienced none of the above symptoms. When teaching at the Island school she also felt better and more energetic.

She has recently spent three years furthering her education as a reading and early childhood education specialist. During some of this time, she combined teaching with part-time study at OISE. While an OISE student, she related her headaches and poor health to lack of ventilation in the building, a common complaint from other students, many of whom also found it difficult to work in their offices there.

About the same time, this woman began to find walking in the city tiring and was surprised to find that, even after some time away from the pressures of teaching, she was still feeling generally fatigued. By April 1985 she was falling asleep at her typewriter. She also had trouble concentrating while reading and found that at times her writing was disorganized. She still felt tired after an afternoon sleep, and often felt nauseated, dizzy and experienced diarrhea. After consulting a nutritionist and being prescribed vitamins for food allergies, chemical allergies were also diagnosed but no treatment given. Within one month she felt much worse, now becoming dizzy and nauseated when exposed to exhaust from diesel trucks.

By August she was getting no sleep at night, experienced chest pains, was forgetful, was short of breath when talking on the phone, and had even more trouble with her typing and spelling. She felt bad on her trips into the city also. Once she experienced such confusion that she couldn't figure out which exit to use after disembarking from the subway. When exposed to automobile exhaust, she would feel either euphoric and drunk or depressed.

After meeting TV producer Larry Gosnell who had produced a program for CBC on the "20th Century Disease", she began to understand her problem and visited a clinical ecologist. By September, when she finally got an appointment with this doctor, she was regularly fainting, experienced shortness of breath, was very thin and had vision problems. She described how, after emerging from the bath, she looked burned from contact with the water.

After being tested for allergies and sensitivities, she learned that her reading and typing problems had been caused by a reaction to formaldehyde in newsprint and the carbon ink of the typewriter ribbon. Chemicals in the paper of new books and mould in old books both bothered her.

Her problems in traffic were caused by allergies to phenol and ethanol found in gasoline. She feels that her sensitization has been a slow progression of events and was not related to one event or building. Looking back, she remembers always opening the windows in her classrooms during the winter and enjoying certain old buildings such as Hart House at the University of Toronto over others where the windows didn't open.

As a reading specialist, this teacher has been interested in observing both teachers and children being tested at her doctor's office. She has seen many reading problems and learning disability symptoms induced by exposure to foods and chemicals. She feels that this experience has given her new insight as a teacher into various behaviours and that other teachers could also learn to recognize these symptoms in their students.

SPEAKER #2

The next speaker was the parent of a child attending the Alternative Primary School near Forest Hill Collegiate. She represented a group of parents who are concerned about the use of green wood preservatives on school ground play equipment. Chromated copper arsenates are used to treat the wood in these wooden climbing units, one of which has recently been installed at her child's school.

The woman referred to a study for the Toronto Board of Health by Kate Davies on these preservatives, as well as to an October 1984 MacLean's magazine article. CCA, as the preservatives are called, can be carcinogenic. They are injected into the wood to a three inch depth and leach out in certain weather conditions. They collect on the surface of the wood, crystallizing into a white coating which rubs off on children as they play on the equipment. There are reports of children developing sores and rashes after exposure to the arsenates.

The teachers at the school were asked to have the children wash their hands after playing on the equipment while the parents worked to find out more about long term reactions and solutions. The parents have requested after-hours access to water from the school in order to wash down the equipment and are presently pursuing the idea of using a sealer on it. The group of parents feels that the Board of Education should look into alternative ways of preserving this wood.

SPEAKER #3

The third speaker was a teacher at Wilkinson Public School, a school that has had a history of indoor air problems. He reported the following episodes and experiences:

Students and teachers have had to flee the smell of burning garbage in the halls. Parents visiting the school report headaches. A visiting teacher reported feeling very tired and unable to breathe when at the school. Many students experience sore throats on an on-going basis. A parent reports that a student usually taught in a portable classroom was ill when in the main building. A teacher regularly sneezes when in the building. A rabbit regularly sneezes in the building, but hardly ever when a teacher takes it home for the weekend. Teachers report feeling "terrible" and students are lethargic and apathetic on a regular basis.

One teacher bathes his eyes after a day in the classroom. Caretakers say that the school is impossible to keep clean. Teachers must daily clean furniture and window ledges of a black film. Parents often complain of foul odours in the school. Seven year olds regularly experience headaches. One teacher has red, sore, puffy eyes and dry skin problems, is unable to breathe properly and is hoarse by 9 o'clock in the morning. Hoarseness, sore throats and laryngitis are experienced by most teachers.

One teacher in particular was reported to be a sensitive barometer of the air quality in the school. When he came to the school in 1973, he was healthy with no respiratory problems. Since then he has been on a variety of drugs for a recurring sinus problem. He has also had tonsil and sinus operations which have not removed his symptoms. Doctors say that this sinus problem also causes his double vision and headaches. All symptoms disappear after he has been away from the school for a few days.

The speaker suggested some causes for the school's problems. He says that the school's caretakers fight a losing battle to keep it clean. It was suggested that perhaps the fresh air duct system has never been cleaned. He claimed that it hadn't been done since he began teaching at the school in 1958 and felt that the dust could be recirculating throughout the school.

An in-school incinerator has, in the past, been the cause of a number of smell and smoke problems throughout the school. A new caretaker has recently stopped burning plastics, paint cans, etc. in the incinerator and the fumes haven't been circulating. The speaker expressed a concern about back drafting of fumes from the incinerator chimney into the school and the possibility of carbon monoxide and carbon dioxide gases circulating throughout the school.

Lack of humidity is also a problem at the school during the cold weather. The speaker felt that perhaps a small tank of water over which fresh air flows after entering the school could be increased in size. In the older part of the school, there are no fresh air or return air vents in any of the hallways or stair wells, increasing the ventilation problem.

It was reported that about 25 teachers in the older part of the building have been affected by the air problems, while only 7 or 8 remain unaffected. The speaker hasn't polled the students, but knows that many of them complain of headaches, etc. He teaches at the school's learning centre and described one grade 5 boy who constantly has a dripping nose and cough. He transposes his letters, skips lines, has a reading problem and trouble concentrating at times. After being away from the school for a period of time, he is an entirely changed child, experiencing none of these problems.

SPEAKER #4

Speaker #4 passed around written recommendations to the audience as a way of saving time with her presentation. She said that she also attended the first public meeting and congratulated the eloquent parents who spoke at that time. She feels that these presentations are only the tip of the iceberg, saying that many people have trouble isolating health problems such as headaches and fatigue, not realizing they are caused by chemicals in their environment.

This speaker described both the difficulty in educating herself about the sensitivity problem and expense of dealing with such sensitivities. Appropriate treatment by clinical ecologists is not covered by OHIP or the teachers' extended health plan. She suggested that there is a need for education of teachers about the chemical sensitivity problem. She mentioned Dr. Rita Dunn's learning styles model that incorporates temperature, light and sound, but not air quality, as the type of presentation that could be used to help educate teachers.

The speaker also referred to stress and how it relates to the indoor air quality issue. She mentioned Dr. William Crook's work on stress and its negative effect on learning. Teachers in her school have definitely observed how staff behaviour correlates with air quality. One teacher was described who found herself over-reacting to students, often bursting into tears in the classroom. She said that one of the first things to be affected when people are experiencing a reaction to chemicals in the environment is the sense of humour, a necessity in the teaching profession.

Three of her co-workers have developed extreme chemical sensitivities, with one developing an immune system problem. Special problems exist in her school's library. It has no windows and is located in a sort of a well, surrounded by classrooms. Smells in the room have been identified as "foundry fumes", and as it is a technical school, various fumes tend to circulate around the school. A new carpet was recently installed because the underpad of the old one was badly deteriorating and causing a foul smell. The new carpet has its own smell, but this is improving as the carpet ages.

Six years ago, the air quality of the school was investigated and the air intake louvres were found to be rusted shut, letting no air in. Banks of low, overlit fluorescent lights are also a problem, according to this speaker. Some teachers purchased full spectrum lights from the library fine funds, but she reported that they experienced some resistance to installing them.

The school has leaky roofs which the speaker suspects may cause mould growth, creating problems for at least two staff members who have yeast sensitivities. Photo copiers also cause some problems for some staff members.

She feels that ventilation and teacher education are the priorities in her school. She referred to the last public meeting when a parent described a problem with perfume and tobacco smoke from a teacher making her child sick. This speaker feels that teacher education would make it easier for parents to approach teachers on such issues.

SPEAKER #5

Another woman then spoke who had also attended the first public meeting. Her 7 year old son has chemical sensitivities and attends school in Mississauga. He exhibits behaviour problems in school that are not apparent elsewhere, such as clumsiness and a tendency to break things and hyperactivity. The mother feels that his problem is worse at this school than at the school he previously attended in another area.

In spite of the mother's detailed explanations to the school of her son's problems, she feels that the boy is often disciplined unsuitably. It is her opinion that there is a great need to educate teachers about the hazards and manifestations of chemical over-exposure. She feels that teachers should be able to understand the behaviour of such children, help them to avoid offending substances, and help them deal with the stress caused by other children's taunting.

Many substances in the school affect the child, including the operation of a laminating machine, the smell of which has caused teachers on the floor above to complain. The section of the school in which the boy's classroom is located is closed off by heavy doors, inhibiting fresh air circulation.

SPEAKER #6

The next speaker lives in the Riverdale Collegiate neighbourhood. He described how he purchased his house there thinking it was outside the range of lead contamination from the Canada Metals plant. After having the soil in his garden tested and discovering very high lead levels, he had his 2 year old daughter tested as well. She has the same lead level in her blood as does her 36 year old father, a fact that greatly alarms him.

His neighbour recently remarked to him that a second special education class has been set up at St. Joseph's School, for a total of 3 in the area. He claimed that of 8 school-aged children on his block, 3 or 4 are bused to schools out of the area, but of the remaining 4, 3 attend these local special education classes.

A letter he wrote to the Board in October hasn't yet resulted in any action on the subject, according to the speaker. He also suggested that the public meeting was very poorly publicized. He stumbled upon it on the way to another meeting, and claimed that none of his neighbours knew about it either.

His business involves doing solvent recovery projects and other such waste chemical studies for industry and government. He said that he feels janitors may not be able to read or interpret labels on chemical products, therefore it is necessary to educate these workers to order safer materials and use them in safer ways.

This speaker is very concerned about central nervous system damage because of exposure to atmospheric lead, and will likely move away from the area in order to protect his children. He feels that the Board of Education has a responsibility to act to influence the city on environmental problems.

SPEAKER #7

The next speaker was the mother of a 14 year old chemically sensitive daughter. She described how the girl has always been prone to colds and needed a lot of sleep. Eventually, though, her colds turned into viruses and she would often be sick on Fridays, recovering by Monday.

By senior public school, the girl began to feel uncomfortable while swimming, and didn't want to participate in swimming class. In grade 8 she was very sensitive to the swimming pool and science laboratory.

After the Christmas holidays of that year (83-84), she became so ill she could no longer enter the school building. The mother said she doesn't know precisely what caused her daughter's health to "turn the corner", but she had many symptoms: severe body temperature fluctuations, headaches, inability to concentrate, fatigue, a tendency to burst into tears when asked questions. A doctor diagnosed a virus and advised the girl to stay home and recover. Upon returning to school, her symptoms returned within 20 minutes of being in the building, so she finished the school year with a home tutor.

A medical search turned up sensitivities to many foods and chemicals. The mother feels that the sensitivities began with foods, then accelerated to include chemicals and inhalants. She is being treated and is now back to school. The treatment consists mainly of avoidance of chemicals and foods to which she is allergic. The mother said that they can control the food aspect, but it is difficult to avoid what she said were the 18 to 19 different chemicals in the school environment. The fact that these chemicals can occur together in varying combinations makes it even harder to define exactly what she is reacting to.

The speaker expressed resentment about the large medical bill that the family must pay in order to keep their daughter's sensitivities neutralized so she can attend school and cope with all the chemical exposures there.

She feels that her daughter's sensitivities developed due to over-exposure to chemicals and that it is a spreading phenomenon. It is her opinion that her daughter isn't an isolated case, but only the tip of the iceberg, with the problem accelerating in seriousness if kids continue to be exposed to so many harmful chemicals. For instance, she has a son, always thought of as the healthiest child in the family, who has suddenly become sick since painting began in his school.

She has a child at Allenby School and has been told by the maintenance staff that pesticide is sprayed there once a week to control roaches. Apparently the spraying isn't necessarily done on weekends in order to at least lessen people's exposure to the dangerous chemical. She feels that there should be much more concern on the part of education officials and that the school should take more responsibility for the problems of children like her daughter.

SPEAKER #8

The last speaker has been a teacher for 9 years and is on a 6 month leave of absence from the North York Board of Education. Although he claimed to not blame all of his ill health on the school system, he does attribute much of his allergic condition to his work environment.

He was teaching chemistry and sharing a classroom with a grade 13 chemistry teacher. He found that many of the chemicals used in the classroom bothered him to the point of extreme fatigue. After seeking medical help, he discovered that he has many food and chemical allergies. He attributes some of his vulnerability to these sensitivities to childhood celiac disease.

He is very concerned for the health of students and feels that many of them are building up chemical sensitivities similar to his. During a 2-year period teaching art, he observed many allergic behaviour reactions to art materials, even though he feels he ran a "clean" classroom due to his own sensitivities. He suggested that the mould growing in paint cans could affect students, as well as fumes from various other art materials.

This speaker described how he has experienced much prejudice because of his allergies. He feels that he has not been dealt with professionally by education people concerning his sensitivities. He has also had problems with parents being resentful and non-accepting of his attempts to tell them that their children were suffering from allergies or sensitivities. He feels that there is only so much a teacher can do in these cases, and that cleaning up the environment is the best solution.

He has recently discovered that he is allergic to chalk dust. Having never been out of its influence long enough in the past nine years to pinpoint this allergy, he now knows why he used to be so fatigued in the classroom. By Christmas each year, he would build up a sensitivity to chalk and would sneeze every time he went near the chalkboard. Although he is now being neutralized for this allergy, and can tolerate some exposure, the doctor says the best solution is to avoid it completely. However, he has been told that there is no budget at his school for an overhead projector

Formaldehyde also causes him problems, as it did, he observed, for many students. On days when formaldehyde fumes were in the air, his students acted much differently than on non-formaldehyde days. Hostility was one of the symptoms he observed.

He can no longer drink tap water. The chlorine in it fatigues him. He suspects his sensitivity has built up from a combination of drinking the tap water most of his life and being an expert and avid swimmer for many years. Now a swim in a chlorinated pool puts him in bed for up to 4 days. He described how a teacher in one school daily used a chlorinated cleanser to clean graffitti off desks. The speaker feels that small doses of this poisonous substance every day, in combination with other chlorine in students' environments, could cause them to develop a sensitivity to it.

Another teacher used benzene as a thinner while teaching silk screening in a classroom with no ventilation. The teacher later had a nervous breakdown. The speaker expressed the opinion that the Board could help educate teachers about these dangers and make physical changes to buildings that would help the situation. This teacher feels that, contrary to what a previous speaker said, caretakers don't need to know all the scientific reasons for not using certain substances, but merely could be instructed which ones to order.

The speaker feels that the main substance to which students react is food. He has often watched a class of children exhibit markedly changed behaviour after lunch period. Often in the afternoon, 40 to 60% of his students would be hyperactive and out of control, whereas they were attentive and well behaved in the morning. He also feels that the number of students in basic level courses is inflated by many students who are intelligent but exhibit behaviour problems, perhaps due to allergic reactions. He stated that the money to pay remedial teachers could be better spent on trying to find what things are triggering their negative behaviour.

Perhaps, he suggested, the students could be educated on how to help themselves to better health by avoiding chemical exposures in their food and environment. He said that a union of the public, teachers, the Board and students could create change.

The moderator commended the speaker for his courage in speaking out, saying that many teachers seem to feel pressures on them against expressing these things. The speaker agreed that he experiences prejudice and feels that he did take a risk by speaking at the meeting. However, he said that even though he often feels that his job is on the line due to his sensitivities, the quality of one's environment is so important that he was motivated to speak out. He feels that schools should be treated as a sacred place and asked, "What kind of a society are we if we can't design a safe place for our kids to learn?"

APPENDIX B

APPENDIX B
DETAILED SUMMARY OF PUBLIC LETTERS AND BRIEFS

The following pages summarize letters and briefs submitted by teachers, other school staff, parents and interested individuals and organizations during the course of the review of the effects of pollution on education.

Names of individual writers have been withheld, in order to protect privacy. Letters submitted in strict confidence have not been summarized, but their content has been taken into account in the remainder of the report.

Every attempt has been made to include all of the major points made in the letters, but readers wishing further information are invited to consult Appendix F, which is a bound volume of the original letters (with names removed) held in the Board's Administrative Services Division at 155 College Street in Toronto.

The full texts of all letters and briefs have been read carefully by both the consultant team and board staff, and have been taken into account in the preparation of this report. The authors, Board staff and Trustees are grateful for the time and care taken by those who responded.

The entries following include submissions by teachers, other school staff, parents and interested organizations. There has been no attempt to establish any particular order, other than to group letters that had similar concerns. Highlighted quotations have been taken from the letter immediately following them.

"After a whole day in the building, I am guaranteed to have a headache."

A teacher at Contact School wrote about four ways in which she, other staff, and students are apparently being affected. Noise pollution due to the school's open plan makes concentration difficult. Plate glass windows in the front of the building are the only source of external light, with fluorescent lighting being used in the rest of the building. The writer suspects that this lighting causes daily headaches experienced by some of the staff members and contributes to students' behavioural problems. Since the building is poorly ventilated, perfume and cigarette smoke linger in the air as irritants, the latter being a particularly bad problem in washrooms.

A list of pollutants was submitted by one teacher. Paper pollution, the use of methanol in ditto machines, chalk dust, and formaldehyde are listed as being the major concerns. Reactions to formaldehyde are described. One student who was sensitive to formaldehyde had to be taken to hospital and couldn't attend classes in two rooms which were subject to formaldehyde fumes.

A teacher is described as having bleeding gums and breathing problems during dissections. The writer had skin and respiratory problems which are thought to be formaldehyde-related and does not intend to do further dissections in class.

Another teacher wrote with a number of concerns. The "neon lighting" is decribed as being noisy and artificial and a request is made for installation of "growing lights". The cleaning of chalkboards and brushes creates a problem for those with dust allergies, according to the writer, and suggestions are made for decreasing the dust in classrooms. A concern is expressed about the safety of cockroach and termite spraying by the caretakers in the staffroom kitchen. The writer is also concerned about the fire hazard from storage of rags and flammables such as ditto fluid as well as possible dangers to health from Xerox machines and computer/TV monitor exposure.

One letter writer described his extreme discomfort during meetings where smoking is allowed. He discusses a meeting which he recently attended at the Area Central office where one woman chain-smoked through the entire two hours, causing him to have a headache for the rest of the day. He feels that something should be done to preclude this kind of exposure to second-hand cigarette smoke.

> **"I consider it inappropriate to send in painters during school term in the first place, but to do it in winter, when all the windows are closed, seems folly."**

An art teacher at Lawrence Park Collegiate Institute wrote about the re-painting of the interior of the school during the winter of '84-'85, when classes were in session and windows were closed. The writer feels that something, possibly a "quick-drying solvent" was added to the paint, because the smell was more pungent than usual and its effects, including headaches, were very marked. In addition, it is stated that the art classroom is poorly heated (either too cold or heated to over 80 degrees F), increasing the rate of evaporation of solvents. It is also inadequately ventilated, with fumes from oil painting, jewellelry-making and silk-screen printing lingering far too long. One student is mentioned for whom the art room is a hazardous place in which to work, because of allergies. Internal circulation of air in the building is such that the smell of chlorine from the swimming pool frequently spreads into the art classroom.

Smoking in the workplace is the concern of a teacher at the City Adult Learning Centre. It is particularly a problem for people like this writer who have hayfever and asthma. The main difficulty arises during attendance at meetings where smoking is allowed.

A teacher wrote a note about chalk dust aggravating nasal passages and sinuses, and expressing a desire to know more about its effects on health.

Two people from Brown Public School expressed concerns about the central air conditioning system at the school. They are curious as to the frequency of air recycling and the efficiency of germ and dust filtering during the recirculation process. Reference is made to "quite a number" of staff and students being frequently ill at the school.

A letter was received from someone who works in the library at Central Technical School who feels that the library does not have healthy air or light. Students are described as verbally protesting the stale or foul smell in the space, and the writer says that there are three documented cases and one undocumented one where staff members have developed allergies after working in the library. Two of these people have left the school; all signs of their ailments disappeared within months. Two others are still working there and suffering. If the writer does not walk for at least fifteen minutes in outside air twice daily, blurred vision, headache and frayed nerves result.

> **" After exposure to chemical inhalants, I have to struggle to keep from falling asleep. My memory is affected, speech borders on being slurred, I have headaches, and I am sure at times I become short-tempered and irritable."**

A submission from a teacher details sources of indoor air pollution in schools. Methyl alcohol ditto machines produce toxic fumes and she suggests that they should be operated in well ventilated facilities or replaced by photocopier machines. School maintenance procedures such as painting, roofing, use of chemical cleaning compounds and repairs using contact cement are often conducted during school hours, with potentially dangerous fumes affecting teachers and students. She also describes such things as hand soap in staff washrooms with a strong artificial pine odour, operation of pottery kilns in inadequately ventilated spaces, occasional natural gas fumes, lacquer-like odours from local industries, car exhaust (both while travelling to work at the school and evident in the classroom under certain conditions), second-hand tobacco smoke throughout the building, and perfumes, all of which affect her health. After exposure to any of these chemical inhalants, she has to struggle to stay awake, experiences loss of memory, slurring of speech and headaches, becomes short-tempered and irritable. Avoidance seems to be her only defence, with breathing from oxygen tanks a temporary but expensive solution.

A teacher who has had allergies since childhood and who now has severe chemical sensitivities wrote about her personal allergic experiences and those of some her students. A urea-formaldehyde insulated house, combined with exposures in a classroom in which oil fumes were evident each time the furnace was filled and where exhaust fumes from school buses penetrated the room when the windows were open, led to her current sensitized state and caused her to leave teaching. Her letter describes a pupil who sneezed each time the janitor went by with his chemically-treated mop. He hated school and was scheduled for behavioural classes; the writer wonders if chemical sensitivities were at the root of his problems. She also refers to negative effects of fluorescent lights on people, like herself, who have broken down immune systems. She describes studies that indicate that dyslexic children can be negatively affected by television viewing, as are many other super-sensitive people, according to this writer. She also has concerns about the effect of parental smoking and diets high in sugar on children's learning ability.

> **"It may be very stressful to have a chemically sensitive student "or child."**

A presentation was made by a teacher-librarian at Central Technical School indicating her belief that the stories told by mothers at the public meetings are only the tip of the iceberg. She makes the points that: 1) reactions to chemicals can manifest as fatigue, stress, irritability, and headaches; 2) many people, including many physicians, can't isolate the source of such health problems nor are they able to attribute them to allergies or sensitivities; 3) conventional allergy testing methods often produce inaccurate results and alternative treatment is expensive and not generally covered by health insurance; and 4) the mothers who have made presentations are those fortunate enough to have had the time, commitment and financial resources to help diagnose their children's problems combined with the self-confidence to speak about these problems at a public meeting—there are many more not in this situation.

The presentation discusses how an individual student's reaction to indoor air pollution is an aspect of that student's learning style and presents a framework, provided by learning styles researcher Dr. Rita Dunn, for examining the effects of polluted environments on learning. Also presented is a model by Dr. William Crook which shows the relationship between systemic and nervous system allergies and emotional, behaviour and learning problems in children.

Recommendations are made to help with the problem of chemical exposures and sensitivities within the school environment. The author suggests that painting in the schools should be restricted to holiday periods and done under well ventilated conditions, and that the major sources of chemical problems and availability of alternative products be investigated. Alternative forms of evaluation could be investigated for chemically-sensitive students, according to the author, and school library resource centres should be made as healthy as possible for chemically-sensitive students. Specifically, she would like the Central Technical School library to be provided with skylights for natural light and an adequate supply of fresh air. She also feels that the Board of Education should change the extended health care and drug plan coverage to include treatment of the type needed by chemically-sensitive people.

A submission from Winona Drive Senior Public School describes a paper recycling programme involving students and staff which results in a significant decrease in paper garbage and increased awareness of paper pollution within the school community.

A report from a teacher at Jarvis Collegiate Institute mentions spraying of insecticide to combat cockroach infestations as one area of environmental concern at the school. In addition, a situation involving methanol exposure from copier machines in the mathematics department is documented by means of a copy of a letter sent to the Workmen's Compensation Board in April of 1984.

Four teachers suffer from varying degrees of tinnitus that they claim is directly caused by use of methanol copiers in poorly ventilated rooms. The writer states that the first report to the Board of Education of this problem was in May 1983. Air samplings and visits by Board personnel, a visit by the teachers to the Board's doctor, resulted in the Board turning the matter over to the Workmen's Compensation Board. According to the writer, in December 1984, the Industrial Health and Safety Branch of the Ministry of Labour padlocked the ditto machine in the mathematics office because their tests revealed an unacceptably high level of methyl alcohol in the air.

> **"I realize that cockroaches are a problem in Toronto, but for me personally the cure was much worse than the problem."**

A teacher with the Toronto Board of Education wrote with a grave concern about the insecticide spray that was apparently used in the early 1980's for cockroach control in a school where very young children were in attendance. Heavy spraying is described as taking place over a period of several days. The writer and some others on staff experienced nausea and violent headaches, accompanied by unusual taste and smell problems. This teacher feels that the effects of the fumes on young children may be a dangerous health hazard.

A teacher at Market Lane Public School wrote about a fire that was set in a large plastic garbage can located in a portable classroom. Although the fire was quickly put out by several teachers, they were later told that the melting plastic gave off deadly fumes, principally PCBs. The writer expresses concern that four teachers and several students were exposed to these fumes and questions why plastic garbage cans are used in schools.

A teacher at Northern Secondary School wrote about second-hand tobacco smoke. Although over seventy percent of the staff does not smoke, it took some effort to have established a tiny, single washroom, non-smoking lounge. Students and parents have recently been requesting non-smoking facilities for non-smoking students as well. The story of a parent of a smoke-sensitive student is reported. Apparently, the daughter has missed almost half the term because of illness directly related to washroom use under second-hand smoke conditions. The writer had arranged for the girl to have access to the washroom in the nurse's office in order to avoid the smoke-filled student washrooms. The Board is encouraged to treat second-hand tobacco smoke as a severe health hazard, developing a policy that carries sensible consequences for offenders. The writer feels that students should be accorded the right to a smoke-free environment.

> **"Perhaps smoking should be banned completely. Are we not setting standards for our kids?**

A teacher at Dundas School wrote that fumes from the "W400 Liquid Disinfectant Cleaner" used by caretaking staff to clean toilets at the school causes her to have burning eyes and runny nose within two minutes of its use. Apparently the caretakers report that it affects their eyes as well. The teacher claims to not be totally confident in the Board's safety record, due to having working for it when asbestos powder was mixed for use in classrooms and when toxic spray was used to kill cockroaches. The same teacher objects to smoking in the school during school hours, including recess and lunch breaks, saying that smoking should be banned during school hours or completely. She states that at least one third of the staff suffers from allergies.

From a teacher at John Fisher Public School, came a letter describing allergy problems attributed to teaching at the school. The writer taught for five years in a small second floor classroom at the school and had no health problems during that time. She writes that she developed moderately severe allergies, the worst being to molds and dust, after moving to a regular ground floor classroom at the school. They apparently disappeared for most the summer, but returned when she began teaching again in the Fall. Her allergies are severe enough to require the use of strong painkiller/antihistamine/ decongestant compounds and on some occasions she has developed infections that have required antibiotics. The high level of dust in her classroom recently caused her to experience a severe allergy attack and she describes other, sometimes severe, unaccustomed respiratory illnesses experienced by other staff members. The writer suggests that since these teachers are all young and fairly new to their grade levels, the stresses of heavy workloads may be helping to cause their allergic reactions.

> **"These problems only seem to occur during the teaching year and clear up during holiday time."**

A letter was received from a teacher at Western Technical School about an air quality problem on the third floor of the school's new wing. The writer reports that three teachers have complained about sinus headaches and related problems which only seem to occur during the teaching year and clear up when school is not in session. The writer is concerned about a rumour of asbestos in the ceilings and no plans to remove it, but also suggests that the problem may be due to chalk dust.

A teacher with the Toronto Board of Education wrote to describe an incident that occurred eight years ago at Eglinton Public School. A rug in her classroom was cleaned with a substance that caused her and her pupils' eyes and noses to run. She says that it was so irritating that she refused to teach in the room for a two-day period, until the fumes were gone.

Dryness in the air at Bickford Park High School is the subject of a letter from a teacher there. The lack of humidity in the school's air causes blocked nasal passages and often, severe headaches which making effective teaching difficult.

A teacher at Glenview Senior Public School with 18 years experience wrote to share her experiences. She has allergies to dust, pollen, fur-bearing animals, ragweed and trees (in particular, poplar trees). These allergies, she claims, developed only after moving to Toronto to teach, and were not present as a young person. Chalk dust and dust on shelves cause her to sneeze, have major eye irritation, sinus congestion and headaches. Cigarette smoke in the staff room and Lombardy poplars on school property also aggravate her allergies. She reports that the school is being painted this year, giving her headaches during the first two weeks and causing her to be ill to the extent of being absent for six days in subsequent weeks. She expresses concern for her health and comfort, her effectiveness as a teacher and the effects of paint fumes on her students. She also describes effects of pollution that she has observed in many students, both allergy sufferers and those who aren't allergic. These are headaches, itchy eyes, runny noses, fatigue, nose bleeds, visual problems, shortened attention spans and absenteeism. She feels that many children suffer quietly, trying to keep up with the class in spite of the lack of sympathy on the part of the uninformed.

A letter was received from Subway Academy One describing a three-year-old air quality problem at the school that is specifically related to an oil heated portable classroom. In May 1983, an incidence of high concentration of oil fumes in the classroom was reported to the Board's Health & Safety Dept. Use of the classroom was difficult for a two-week period and many of the staff and students experienced dizziness, drowsiness, nausea, respiratory difficulties and headaches. In addition, the writer says that the oil fumes appeared to aggravate the existing medical conditions such as allergies and respiratory problems of staff and some students. The oil fumes can apparently still be detected on occasion and the writer expresses concern about the medical effects associated with long-term exposure to the air in the classroom. The Pollution and Education Review Group is invited to visit the portables at the school and assist in changes to improve the quality of the environment there.

"I went through a whole bottle of Tylenol for headaches in one week."

An educational assistant wrote that school repainting has been causing staff and students from her classroom to experience such severe reactions that they have had to leave the building. The teacher and children had headaches, cramps and nausea. The writer experienced headaches, nausea, diarrhea, cramps, chest pains and shortness of breath. The painting, underway during school hours, from Christmas to March break, has also disrupted the classroom program and affected the children's concentration and behaviour. The writer feels that she does not have allergies, but says that chalk dust causes her breathing difficulties and irritates her eyes. She says that, in her classroom, they never use aerosol cans or spray paints, due to the negative health effects of these materials. She expresses concern for the health of staff and students.

A letter was received from a woman in Ottawa who works as a lunch-room aide at an elementary school. She is chemically sensitive to formaldehyde, tobacco smoke, car exhaust, natural gas, newsprint, and synthetic fabrics. She reacts to such things as floor polishes, paints, and inks used in office machinery as well. As a child she was hyperactive and a "clever under-achiever". During the winter, when the school is closed up, she experiences such symptoms as slow thinking, headaches, and memory problems. She finds Mondays the worst, as the school has been closed up over the weekend. The school is described as being old, has been renovated and remodelled, is heated by natural gas, has completely carpeted classrooms, curtained windows and fluorescent lights. Due to lack of space, the sick room is located in a curtained-off portion of the office, where smoking is allowed and office machines are used. The writer describes one child who refuses to each lunch as he has found he can concentrate better and is less hyper if he doesn't eat. Another allergic child is described who is often away ill and complains of headaches and feeling disoriented. In this classroom, art materials, such as paint in plastic containers, are left lying open all the time. This woman has found that airing out the room and turning off the fluorescent lights improves the childrens' behaviour. She feels that car exhaust from waiting school buses and parents picking up children is also a major problem at the school. Over the twelve years she has been working as an aide, she claims to have definitely noticed a change in the childrens' behaviour when winter comes.

"For the past 3-4 years my daughter has had a constant headache at school."

A parent wrote describing the experiences of her daughter while attending three different Toronto Board of Education schools. Now fourteen years old, the girl has a history of colds, allergies to dust, molds, pollen, grasses, trees and eggs, and constant headaches while at school. After a tonsilectomy and chemical anaesthetic in 1983, her symptoms became more severe, and she was found to be chemically sensitive to chlorine, formaldehyde, ethyl alcohol, natural gas, car fumes, and tobacco smoke. She would break out in hot and cold sweats, experienced mental confusion, loss of hand coordination, stomach aches, bladder urgency, joint pain, muscle fatigue and emotional lability. She cried when confronted and was unable to continue to attend school. The writer states that this type of illness can be precipitated by excessive exposure to pesticides, herbicides, ditto machine ink, fumes from painting, tobacco smoke, art supplies, carbon monoxide and formaldehyde. She feels that the combination of the low levels of all the chemicals to which we are exposed each day is dangerous. She has a concern for her five-year-old who attends Allenby School where she has been told that they spray once a week for cockroaches. She wants action taken to use non-toxic materials.

"We aren't suggesting that it is a disease that everyone will catch. The fact remains that it is a serious problem to the children and parents affected."

A submission from a parent with children at Withrow and Quest School describes her concerns both with the air quality in the building and the way the administration has dealt with the problem. She writes that a newsletter sent to parents confirms her feelings that the school administration does not take seriously parents' concerns about the school's air quality. She questions a statement made by a school board engineer at a public meeting that schools are built for the "norm", wondering what percentage of children in a school are considered expendable by the engineers. She states that all children have a right to a safe educational environment and that, in addition to high C02 levels and lack of humidity, many other factors may be affecting their health such as use of insecticides, paints, cleaning products, art supplies or many other chemicals. Painting while school is in session, the use of very strong cleaning products and floor waxes, the fact that science lab, darkroom and kitchen are located in the same small, poorly ventilated room create, according to the writer, a dangerous situation, especially for children who are particularly sensitive to chemicals. She notes that although the Board of Education has produced a data sheet binder (Chemical Data Sheets), many teachers aren't aware of its existence in the school. She suggests that the data sheets should be kept near the activity which involves the chemical.

This same presentation describes the writer's two children, both of whom are chemically sensitive. One son was severely affected by paint fumes in the school last year, at which point his reaction changed from being mild to having major asthma attacks necessitating the use of bronchodilators. An incident is described wherein the boy refused to clean something in the classroom with Ajax cleanser unless he could use gloves. Upon refusal by the teacher, the boy suggested that the teacher call his mother (who had formerly registered her son's chemical sensitivity in his file). Instead, the teacher kept the whole class late while the boy cleaned up and was taken into the photographic darkroom to discuss what the teacher felt was his "defiance". He was then made to clean the rugs with a science alcohol solution as punishment. The boy, feeling that his mother would be upset over the incident, didn't tell her; it came out the following day while he was having a pulmonary function test at a hospital. The mother feels that this ignorance about chemicals and chemical sensitivities is widespread on the part of teachers and that they need to be provided with information on the topic. She would like to have the Board's assurance that a child will be allowed to refuse to do an activity if he/she feels that it is unsafe.

The same writer describes another son who is in grade one. He has frequent headaches with nausea, respiratory problems and nosebleeds. She feels that it is necessary to gather accurate information that would make it possible to logically correlate the various symptoms with environmental factors.

> **"For children to be concerned about the future of the environment they should be encouraged to be aware of their surroundings. A window would help. Thanks."**

The daycare centre housed in Withrow Avenue Public School sent a submission noting that the daycare centre has no windows at all, and that the air is stale, cold, and dry. The many parents who signed the submission also indicated concern that this environment was not a healthy one, and that it is important that their children have natural light, a view to the outside, and fresh air.

A letter was received from a parent with a child at Withrow School. She expresses concern about and dissatisfaction with the responses given by Board representatives at a parent meeting concerning air quality at the school. She describes her daughter's serious inner ear problems and says that a teacher at the school has had similar problems which her doctor attributed to the lack of humidity in her workplace. The writer feels that the humidity level in the school is much too low and that it should be increased.

"A child's body is far more accurate than any machine".

The parent of a child who attends Withrow School wrote to request that windows that open be installed in place of the present sealed units. She feels that there is an air problem in the school that is causing many children and teachers to be absent from school with a variety of illnesses. She says that her son has, since the Fall of 1984, been complaining of stomachaches, nausea, nosebleeds and headaches. The family physician cannot diagnose a problem. This writer also suggests that the air handling system be inspected on a more regular basis than was described at a recent meeting with Board maintenance engineers.

The mother of another Withrow student describes her daughter's health complaints in a letter. Since January of 1985, the girl has been complaining of headaches and sore legs to which a physician couldn't attribute a cause. The mother recently realized, from speaking with other parents, that other children in the school are suffering from similar problems. She is convinced that her daughter's health complaints stem from poor air circulation in the school and wants immediate action taken so that she won't have to remove her child from the school.

A mother wrote to describe her children's physical complaints resulting from attendance at Withrow School. She says that her son attended the school from September 1984 to January 1985. Because he returned from school looking pale and fatigued and constantly complained of being tired, he was put into the Montessori school which he had previously attended. Her daughter attends Quest Alternative, which is situated in the Withrow building. She regularly experiences a dry cough during attendance at the school, but didn't have it during spring break. She feels that the classrooms are overcrowded, the air is dry and stale, and the teachers are unable to relax.

A father wrote that his two sons and many of his relatives' and friends' children have allergies. He doesn't know the cause of the allergies, for which his sons are receiving medication and allergy shots, but hopes that if industrial pollution is affecting their health the Board of Education will be able to solve it. He describes how his sons' sleep is disturbed by their allergic reactions of runny noses, coughs, etc. and says that inadequate sleep in turn affects their learning abilities. He feels that pollution affects children more than adults because of children's lower resistance to illness.

A family in Saskatchewan with severe chemical sensitivities wrote about their experiences. Their letter describes how, during renovations to their home, a supposedly chemically benign acrylic caulking compound was used to seal windows. The fumes caused such symptoms as nausea, headache, fatigue, inability to concentrate, hallucinations, eye, nose and throat irritation, and asthma attacks in family members. An eight-year-old daughter became too ill to attend school, and she and her mother had to temporarily move out of the house. The woman writes that her daughter's allergies and chemical sensitivities have become much worse since this exposure. Another instance was reported concerning an exposure in school. A bookshelf in the girl's classroom had been painted with an oil-base paint, causing her to have constantly recurrent fevers as well as nausea, stomachache, headache and unbearable fatigue. Her doctor felt that the only chance she had to get beter was to stay out of the school system for awhile, according to this writer.

> **"The roof of her building was tarred while school was in session. Since that week, she has had a headache every day."**

A parent from New York State wrote about her fifteen-year-old daughter who is unable to attend school and is currently doing ninth grade by homestudy. She has been under treatment for serious environmental illness and food, inhalant and chemical sensitivities for over a year, but had migraine headaches diagnosed as early as second grade. The child's problem went undiagnosed for many years by a traditional pediatrician, a neurologist, a psychologist, a social worker and a traditional allergist. Under a school renovation program in 1980, the roof of her building was tarred while school was in session. Since that week, she has had a headache every day and her attendance at school began to fall sharply at that time. At her current doctor's request, the school building was tested for formaldehyde, with the results showing levels ranging from 0.02 ppm to 0.12 ppm. The girl's blood count for formaldehyde is presently 6, down from 8 in 1983. A Volatile Organics Screen Test (VOST) showed a 100 times normal level of trimethylbenzene. The mother reports that two secretaries, a Guidance counsellor and numerous teachers have developed a variety of complaints, including headaches, while working at the school.

In a subsequent letter, the girl's mother documents the disease's progression as it relates to the girl's schooling. She had a pattern of vomiting easily during pre-school years, but it increased in frequency, preceded by dizziness, during elementary school. By fifth grade, her teacher noted inconsistent learning, with the girl sometimes unable to understand material that she knew the day before. Her handwriting changed at this time to hard-to-read, round, overlapping letters. Confusion was also noted by her sixth grade teacher; she appeared to work harder than other students, but accomplished less. Daily exercise programmes at school caused her to be dizzy, collapse and vomit, so she was exempted. By eighth grade, she was able to attend school for a maximum half-day, had continuous headaches, on and off dizziness, surprise migraines and academic difficulties. During this year, she was finally diagnosed, at the Environmental Health Center in Dallas, Texas, as having environmental illness and treatment began—a clean, isolated environment, organic foods, a rotation diet and immunotherapy. She tried to attend school for grade nine, but only lasted five weeks, attending from five minutes to three hours daily. Her mother notes that spraying for bees in the classroom during this time didn't help her condition! She is currently being classified as "handicapped impaired", a status that will help the school authorities deal more efficiently with her situation and, it is hoped, provide funds for computer facilities.

The writer feels that school administrators and teachers should be made more aware of environmental illness and chemical sensitivities so that they can develop ways of handling students with such problems. She also suggests that environmentally safe classrooms should be provided for those students who are well enough to leave their homes.

A parent and former teacher wrote about what she calls "put-down pollution". She feels that negative comments among students and from teacher to student corrupt the environment, causing anxiety, hostility and frustration. This leads to poor concentration and interferes with a good learning environment. She feels that schools could work toward a solution to this problem in order to improve educational problems for the individuals who suffer anxiety because of such an environment.

> **"These children were unable to control their behaviour or be productive in their academic studies because of exposures to different things in their environment."**

A presentation was received from a former Early Childhood Education and Special Education teacher who now works as a counsellor and technician with a physician in the field of clinical ecology. She is chemically sensitive herself. She describes children that she has observed, both as a teacher and during the course of her current work, who react adversely to substances that do not seem to bother other children. She writes that the many children that she observes who are affected by their place of learning are found to be sensitive to petro-chemically originated products, as well as to foods and inhalants. She reports that the concerns of the many teachers who have been diagnosed as chemically sensitive are painting, spraying of pesticides, tobacco smoke, copying machines, strong cleaning products and perfumes. According to this writer, the lack of understanding and consideration shown on the administration level have left many totally frustrated. She describes how asthma, coughing, hives, body stiffness and seizures as a result of constant exposures to gas heating, perfumes, tobacco smoke, and renovations in the school caused her to quit her teaching job.

A list of major environmental offenders was included, along with possible alternative measures that can be taken to lessen the chemical contamination found in the classroom. The writer points out that many of these are things that can be done at little or no cost and would greatly improve the quality of the learning environment. In many cases, alternative products can be used for pest control, cleaning, deodorizing and decorating. Repainting of schools can be done in the summer with proper ventilation, dry copier machines can replace methanol copiers, school buses could be required to turn engines off while waiting for children to board, synthetic carpeting with rubber underpad could be replaced by hard floors or natural fibre carpets and smoking could be banned. The suggestion is also made that electric heating be used in schools rather than gas or oil. The writer stresses the importance of adequate ventilation, especially in art, science and vocational classes.

A written presentation was received from a woman who also made an oral presentation at the second public meeting. She is a teacher for the Toronto Board of Education and is presently on a study leave. Severe chemical and food sensitivities prevented her from returning to teaching as scheduled. She now has severe sensitivity to phenol (found in plastics, sprays, perfumes, dyes), ethanol (found in magic markers, paint and varnish remover, inks, glues, cements, fresh newsprint, and cleaning fluids), formaldehyde (found in newsprint and building materials), and chlorine. She now feels that some of the students she has worked with in the past who have had learning difficulties may have been reacting to substances in their environment. She described her thirteen-year-old daughter who has mild allergies. The girl has a sensitivity to chlorine and experiences breathing difficulties during gym class when required to swim many lengths of the pool. After these episodes she experiences dizziness, nausea, vision problems, and headaches.

> **"It now seems possible that many of these slow-learners could be helped if consideration could seriously be given to environmental factors."**

The writer asks if it is possible to open a classroom for chemically sensitive children or to create an alternative school devoted to being environmentally clean. In addition, she makes a number of suggestions for changes that could be implemented immediately and which are quite inexpensive. Curriculum could be designed, in the subject areas of Family Studies, Social Sciences and Physical Education/Health, or through integrated programming, to inform and provide children with some skills for dealing with their environment more effectively.

She also suggests that an annual city-wide teachers' federation education day could be an opportunity to conduct a workshop on the topic of pollution and learning and that teachers' federation magazines could be a means of introducing teachers to the subject of environmental sensitivity. She would like to see a manual and/or a video produced for use by teachers and parents who are dealing with sensitive children. The writer feels that publications need to be supplemented and monitored with workshops and courses and that counselling with children, parents and teachers is essential in order for useful changes to be understood and made. There is also a need for research to find alternatives to potentially harmful products to be used in the school environment.

A submission was received from a former high school teacher and parent of two elementary school aged children who has severe environmental sensitivities. In late 1979 she and her husband insulated their house with urea formaldehyde foam insulation. Within a few months of the insulating, she became ill with constant headaches, sore throats, dizzy spells, backaches, fatigue and mood swings. After less than two years in the UFFI house, the writer became so ill with fainting spells followed by seizures that she was hospitalized in an environmentally controlled health unit in Chicago. Her husband and children also experienced chronic lethargy, headaches, stomachaches, sore throats and fevers, ear and eye infections and emotional upsets. The family has since moved into another house which they have tried to make as environmentally clean as possible. It has electric heat, hardwood floors, painted walls and many windows. They removed all carpets and washed the whole building with water, baking soda and vinegar before moving into it.

The writer's children attend school in Durham Region. In a previous school, even though they experienced illnesses at home due to the UFFI, they felt well and excelled at school. After transferring to another school when the family changed homes, they reversed the pattern, becoming ill and unhappy at school, often having difficulty concentrating. Whenever the writer entered the school, she experienced allergic reactions: she couldn't think, would feel weak and dizzy, lose her concentration, and begin to faint. Classroom windows could be opened, so she felt somewhat better there. After discussions were held with school staff, classrooms were aired out regularly and teachers refrained from wearing perfume, enabling the children to cope better, although they still performed "below par". A parental request that the school use safer cleaning products was viewed as too extreme.

> **"For our children, indoor pollution at school has brought many problems."**

Painting in their school in Spring 1983 which took place after school hours caused the children to stay home ill. The daughter, especially, felt dizzy, weak, fatigued, nauseated and depressed and had difficulty concentrating. A request from the parents that the windows be kept open as much as possible was granted because several students and teachers were also experiencing reactions to the fumes.

During the period when painting was taking place, the writer and her husband contacted the Superintendent of Education to request that no schools be painted during the school year. The correspondence is included with the submission. The Superintendent, school principal and vice-principal have all been helpful and willing to change policy.

The writer's son is now in a classroom in which he feels well and has a teacher with allergies who is very understanding. The daughter is now in grade 9 at a school where the air circulation is excellent, according to her mother. Prior to her attending the school, the vice-principal gave the parents a tour of the school and was very supportive. She avoids the music room which is in a newly-carpeted portable classroom. She is allowed to leave the art classroom if she is bothered by materials there. The art teachers have recently attended seminars to learn about minimizing chemical pollution in art classrooms. Although the science lab is well ventilated, the writer feels that dissecting specimens with the use of formaldehyde may present a problem for her daughter. The school has given her permission to take an air purifier and fan to the classroom if necessary.

The writer has been taking a typing course at a local high school. Her teacher has been very supportive. After fainting and having a seizure during several Monday classes, she learned from maintenance staff that typewriters and desks are cleaned with chemicals during the weekend, a practice that was discontinued for her sake. Unfortunately, during March Break the whole school was cleaned with chemicals and the floors were waxed, causing her to have her worst reaction in a year. Several custodians claimed they had felt ill during the cleaning process.

> **"By removing wheat from my diet, a new light shone. For the first time in my life I could learn. I could read."**

A parent, grandparent, and former teacher who is highly chemically sensitive wrote about her personal encounters with chemicals during her own school years, her personal observations as a parent and grandparent, and her observations and experiences during her years as a high school teacher.

She states that despite a love for school and determination to succeed, she experienced great academic difficulty, characterized by a lack of ability to retain information. As an adult, diagnosis of a severe allergy to wheat and subsequent avoidance of all wheat products dramatically removed this learning difficulty. Experiences with and reactions to cigar fumes, outdoor air pollution, dust, various foods and molds are all documented. Similarly, this woman's daughters experienced reactions to a variety of chemical exposures and their resultant negative effects on mental processes during their school years. One daughter found schooling an almost insurmountable problem due to exposures to hospital chemicals and drug medications, chemicals in science classrooms and shop, smoke and gasoline fumes as well as food intolerances. The writer also describes an instance where painting in her granddaughter's school caused the child to be ill.

The writer describes a number of situations where food allergies, chemical over-exposures and sensitivities affected student and teacher performance. One student who was intelligent, yet slow to grasp things, became a top student when his sensitivity to chocolate, eggs and milk was discovered. In two schools at which the writer taught, exams were held in the cafeteria and gymnasium. These rooms were both very polluted, the former with fumes of exhaust, petroleum and spray paint from an adjacent auto shop, and the latter with exhaust fumes from an adjacent busy highway. Also described is two years spent teaching in a room with windows opening onto a flat tar and bonded roof which gave off very strong fumes when exposed to direct sun. When the windows were open at that time of the day, the entire class reacted in a chaotic and hyperactive way. Careless use of cleaning materials, painting during school hours, smoking by staff and students, student use of drugs and alcohol, and development of a sawdust allergy by a woodworking teacher due to lack of proper ventilation in the shop, are all described.

> **"Commercial teachers were tough. They were used to these dreadful conditions. However, even commercial teachers are human, and this one became disabled in 1979, with chemical susceptibility."**

She describes the commercial teachers' work rooms which were two very tiny spaces crammed full of paper, ink, supplies, copy fluid and machines, extra typewriters and other equipment. There was no air circulation except from one small window which opened to allow the fumes from the auto shop below to seep into the room. Attempting to work in these rooms resulted in headaches. A new addition was added to the school which was polluted enough to seriously affect both students' and teachers' health and performance. The writer describes the odour of the new synthetic carpets, glue, fresh paint, and lack of ventilation. Commercial and science classrooms were grouped together in this wing, contributing their respective smells of office equipment and chemicals to the air. In the typing rooms, two very high, small windows opened onto a courtyard and temperatures reached over 95 degrees F at times. The air circulating system also had its intake from this courtyard, which collected fumes from the gas furnace. Serious decreases in student performance due to the copy machine fluid, petroleum fumes, use of chemical cleaners when typewriter repairs were done during class, and lack of ventilation are described. As a result of all these exposures, the writer became ill in 1979 with extreme chemical susceptibility and had to stop teaching.

"Our environmentally ill children and teachers are our 'canaries-in-the-mines' - they are sounding the alarm".

A submission from the Kitchener Branch of the Human Ecology Foundation of Canada is presented in detail in Appendix C of this report (see: Schreiter, Anne L., "Human Ecology in the Schools"). A follow-up to the original reports was also received. A portable classroom is being used, on an experimental basis, for chemically sensitive students, but it is reported that there are major problems with keeping the space chemically clean. A ventilating fan has proven to be too large and noisy; there is no source of fresh air except one window and the children who sit beside it freeze in the winter; lack of storage within the classroom means that cardboard boxes must be used and they accumulate dust; the very nature and construction of a portable building presents some major obstacles, although it does have the advantage of electric heat.

"The problem of chemical pollution does indeed exist and has a direct effect on the performance of our children in school".

A submission from a general practitioner physician with a strong interest in nutrition and preventive medicine was received. He sees many instances of learning disabilities, hyperactivity and other maladaptive behaviour patterns in children who also exhibit heavy metal sensitivity and body overburdening. He feels that in Toronto there is an inordinately high percentage of children who suffer from ecological illness, showing up as recurrent flu-like illnesses which produce school absenteeism. Studies from McGill University by Phil and Park that show a direct link between urban pollution and hyperactive behaviour are quoted as is work by Alexander Schauss which indicates that foods may have an impact on educational performance. He feels that his clinical ecology colleagues could be a valuable source of first-hand experience from dealing with patients suffering from chemical sensitivities.

An associate in the Psychology Department of the Peel Board of Education wrote that, although she does not have objective research evidence concerning the efficacy of dealing with the environment when approaching children with learning problems, her personal observations lead her to feel that research should be done in the field. She describes a boy who was in an Interval Behaviour Class. After being diagnosed as having a large number of allergies and receiving treatment for two months, his behaviour changed from being hyperactive, defiant and argumentative to cooperative, calm and in control of himself. Part of the treatment involved his teacher stopping use of make-up and perfume, and removal of offensive substances such as glue from his classroom. Since that incident, she has also had her son, who has had ear infections, congestion and over-activity problems, tested for allergies. Diet control and change of home environment have remarkably improved his health and behaviour problems. The writer states that she feels that the area of environmental sensitivities should be addressed and, if necessary, ruled out before other forms of treatment are considered.

> **"Bill 82 must be addressed. There is a group of special needs individuals who require attention. These individuals are chemically hypersensitive."**

A representative of the Human Ecology Foundation of Canada, a group of approximately one thousand families who are concerned about chronic and acute illness triggered by the environment, made a written submission. This group has listened to hundreds of stories from families giving evidence about the changes in themselves when exposed to environmental change in their homes, schools and workplaces such as painting, pesticide spraying, cleaning, tobacco smoke, and newsprint. Symptoms experienced by these people range from tiredness to extreme fatigue, from mild headaches to migraine-type ones, from restlessness to hyperactivity, from lack of concentration to brain fag, from nausea to vomiting. The writer suggests that data should be developed on incidence and the present standards should be re-examined in light of what is now known about hypersensitivity. The submission states that there is a group of chemically-sensitive special-needs individuals who require attention within the school system within the context of Bill 82.

The writer describes her own chemical sensitivities which have caused her to leave teaching after 26 years. In 1983, her school was painted with oil-based paint, leaving her ill and unable to work with nausea, muscle pain, and occasional unconsciousness. After this exposure, she gradually regained her health and her doctor was able to develop a neutralizing dose for the ambient air in the school. A pesticide application in the staff room the next month caused her to experience brain fag, crying, and flu-like weakness. A month later the entire school was sprayed, causing her to lose muscle control, including loss of her voice from March to August. The following September she tried to return to teaching, but became gradually fatigued and depressed. By November she again had to stop work with thyroiditis and extreme chemical sensitivities to cleaning products, tobacco smoke, perfumes, markers and so on. She applied for and was denied Workmen's Compensation and is still awaiting an answer on whether or not she will receive Unemployment Insurance and/or Long Term Disability remuneration.

Her daughter is also chemically sensitive. She was diagnosed as allergic at 3 months of age, but not all the rules for allergies worked for her and allergy shots as a teenager seemed to not be of benefit to her. In grade 12, her school was painted with oil-based paint and she experienced seizures. She was transferred to another school, where the staff tried to cooperate. A moldy carpet was replaced in an attempt to help her, but the glue with which the new one was installed caused problems also. When weather permitted, she was allowed to do her school work outside, but eventually transferred to an alternative school where she was not required to attend full time. Here, problems arose when construction work was begun on the building, with a new roof and new tiles being installed. Eventually her seizures became so bad that she stayed home full-time. She is currently attending Trent University where buildings have electric heating, and she has her own room in the residence. She is able to have her own cotton mattress and cooking facilities and organic food storage is provided by the University. She is able to write tests in her own room with a teaching assistant supervising. Since she can only tolerate being in the library for a maximum of five to ten minutes at a time, her teachers have arranged for books to be made specially available to her. Her mother feels that listening, cooperating, and communicating have been the key factors in the substantial understanding received from staff and fellow students at Trent.

> **"We encourage parents to have their youngster draw a picture, print their name, etc., with an unscented water based marker when the child is rested and not reacting. A day or two later the exercise is repeated under similar circumstances with a toluene based marker. Sometimes the results are dramatic."**

A clinical/research dietitian from Alberta Children's Hospital submitted material that has been developed at the hospital for use by teachers of children who are environmentally sensitive. A list of problem areas within the school setting and their solutions is presented to the teacher of a child who has been tested at the hospital and found sensitive to various chemicals. The substances and situations that could cause such a student to react include: scented cosmetics used by the teacher and other students, pets or experimental animals in the classroom, Gestetner-copied material, chalk, scented washroom products, school room supplies such as art materials, rugs, synthetic curtains, plastics, gym mats, cleaning compounds, mold inhibitors, insecticides, trading of school lunches with other children, school bus exhaust, painting in the school, tarring of roofs or playground, and plants in the classroom.

Another handout for teachers describes how to recognize a child who may be suffering from "attention deficit disorders" and may, as a result, benefit from dietary intervention. The symptoms listed include: tired, pale, dark circles under eyes; complains of aches and pains; cries easily, is very sensitive; has rashes, skin problems, very red cheeks, ears or lips; has a constant stuffy/runny nose, frequent colds; has very bad breath; has to go to the bathroom frequently; often sucks thumb, bites nails or chews clothes, rocks in chair, twists hair, repeats words, makes funny noises, has episodes of silly giggling; has holiday highs; behaviour and attention span deteriorate from early morning to noon; is miserable before lunch; is active, inattentive after lunch; has known food allergies; has a sweet tooth; is a sniffer and comments frequently on smells; has a glazed expression in eyes at times; is high after using art supplies.

The writer describes a strategy used at the hospital to encourage teachers to test for sensitivity. Parents are encouraged to have their child draw a picture, print their name, etc., with an unscented water-based marker when the child is rested and not reacting. A day or two later, the exercise is repeated under similar circumstances with a toluene-based marker. Sometimes, according to the writer, the results are dramatic, often containing word and letter reversals and showing marked deterioration in the drawings. The parent then takes the examples to the teacher and asks if the teacher would like to repeat the trials. This apparently often sparks the interest in a doubting teacher. The writer reports that there has been much interest shown by educators, especially those in special education. The submission includes samples of two such series of drawings done by young children.

This submission also briefly describes what the hospital feels is the first intervention study under completely blind conditions to produce good, positive correlations between all aspects of diet (allergy, intolerance, dietary deficiencies and environmental sensitivity) on behaviour, physical symptoms and sleep patterns. Data collection will be complete by the end of 1985 in this study which is being funded by Alberta Mental Health and Health and Welfare Canada.

The University of Toronto Staff Association recently conducted a survey of all its 1700 members. It included questions on air quality because some staff members have apparently been complaining of discomfort or health problems such as dizziness and headaches. A summary of the over 600 responses, mostly from people who work on the university's St. George campus, was submitted. Almost half of the people said they have experienced symptoms that they think may be caused by poor air quality, and half of those reported occasional afternoon headaches, followed by dizziness and nausea. Lack of fresh air was the predominant reason given for symptoms, followed by the air conditioning and heating systems, cigarette smoke, chemicals and dust. About half the people reported having discussed their dissatisfaction with the air quality with a supervisor or other administrator and in about half of these cases action had been taken. Over eight-five percent of people were dissatisfied with the action taken or follow-up done. Four sheets of summarized comments describing the various actions taken and staff lack of satisfaction are included with the submission.

> **"I really regret having to inhale the cigarette smoke constantly five days a week."**

A school caretaker wrote about the problem of second-hand cigarette smoke in the workplace. He stated that most, if not all, lunch room facilities for caretakers are potentially dangerous places for a non-smoker. The suggestion was made that consideration be given to providing a safe area in which to work for all non-smokers in all schools.

An adult student wrote that she has had problems attending the City Adult Learning Centre, having had to drop out once. Within three hours of returning to the building on a second attempt to attend classes, she experienced severely swollen glands, aching muscles, watering eyes, dizziness, inability to concentrate, and coughing and sneezing. She is now unable to even study via correspondence classes due to an allergy to the printed text books.

A woman from northern Ontario with extreme environmental illness wrote describing experiences that led up to her current illness. Her current symptoms are many, but the most disabling are severe depression, weakness and blackouts, resulting in her being unable to work or even care for herself at times. Her letter describes how, during attendance at classes in the University of Toronto's Faculty of Dentistry Building in 1969, she began to suffer from dizzy spells and severe depression. The symptoms first occurred in clinics and anatomy labs, but later generalized. She goes on to detail how conventional psychiatric treatment didn't help her symptoms, and how her health deteriorated over a period of years until she was diagnosed in 1981 as having environmental illness with multiple food and chemical sensitivities. She now lives in complete isolation, supported by her parents and a small disability pension. Specialized treatment is unavailable in her area and she cannot afford to travel to Toronto, nor can she afford to pay for the treatment, which is not covered by OHIP.

"For as many students as you have in your class you will have a different set of answers."

An ecologically-ill woman wrote about some of the situations she can remember from her school days. She believes her education suffered because she was not diagnosed as ecologically ill as a child, but now knows that many of her problems with school work were due to allergies and sensitivities to things in that environment. She says that just about anything can be considered a pollutant, and that with the large number of people with environmental illness (both diagnosed and undiagnosed), the schools should try to control or eliminate some of the major pollution offenders. She remembers falling asleep after travelling on a school bus during grade three and experiencing migraine headaches that began around age four. She describes how, although she loved sports during elementary school, she was very clumsy and received many minor injuries. She now knows that clumsiness can result from a chemical exposure. In grade five, she exhibited a comprehension problem, and was subjected to psychological testing since her grades had previously been good. She now recognizes that exposure to various chemicals, foods and molds can affect her comprehension and memory. Her emotional state and grades declined so much that she dropped out of school in grade ten. As an adult, she took a weaving class but had to drop out when they began dyeing yarns.

A parent and victim of petrochemical hypersensitivity from New York State wrote with some suggestions for lessening the chemical load in schools. His current state of health resulted from overexposure to organic solvents during five years employment in an art conservation laboratory. Low levels of synthetic fumes of any sort cause him to experience headaches, unfocused thinking and general physical and mental problems. He would like to see as much care and study put into the installation of ventilation systems as there is to insulation and heating. This writer also would like to see the banning of chemical pesticides, floor waxes, air fresheners, industrial detergents, new paint while school is in session, combustion furnaces inside school buildings, chemicalized cafeteria food, and neighbourhood polluters. He says that teachers and medical staff should be educated about the potential emotional/behavioural/physiological effects of supposedly benign substances such as perfume on sensitive people.

> **"To ignore pollution's scientific and social implications within our children's educational system will leave them poorly equipped to deal with a problem they will surely inherit."**

A letter was received affirming the need to include fundamentals of ecology in the elementary school curriculum.

Another letter indicated research on the part of one class of students on the subject of acid rain. The writer expressed considerable concern both for the effects on lakes and fish, and on the need for action.

The Watchdog Committee Against Pollution In the Junction Triangle wrote to commend the Board of Education for its initiative in recognizing the problems of pollution as they affect the health of pupils. The writer states that the conclusion must not be made that the small number of people attending the public meeting on February 12th was due to public apathy on the topic. Rather, television and radio stations had stated that public meetings had been cancelled due to inclement weather conditions.

A representative of a lighting manufacturer wrote with information on the effect of artificial lighting on health. He claims that light without the full spectrum induces sleep, causes fatigue, impairs health, accelerates the aging process and invites cancer. He quotes research by the Austrian Institute of Sports Medicine that documents a positive impact from natural or artificial sunlight on improved physical fitness, physical working capacity, decreased heart rate and increased oxygen uptake.

A professor of chemical engineering at the University of Windsor wrote to communicate his interest in the study of the effects of polluted environments on education. He states that his files contain ample evidence that poor indoor and/or outdoor air qualities can affect individuals very significantly.

> **"I really don't want the air to be tested for this, that or the other thing. I want someone to take my word for it that the air is not healthy."**

One writer describes the difficulties she has with lighting and air quality at the Central Technical School Library, which does not have any direct access to outside light and air. She suffers headaches on Mondays, and sleeplessness. Leaving the school twice a day on lunch and unassigned periods has helped to maintain health and control of moods. The writer has experimented with full-spectrum fluorescent tubes in the library office area, and has made numerous requests for similar lighting, and skylights, in the rest of the library.

Another writer emphasized the need to reduce or eliminate smoking in schools. She described her own experience of sharp eye pain and headaches which are occasioned by second-hand smoke getting into her contact lenses. Particularly at exam time, students may be exposed to excessive levels of smoke due to the increased pressure, and this exposure may severely decrease performance levels of students who are particularly sensitive to tobacco smoke.

An unexpected problem was described by a teacher whose classroom windows are frequented by pigeons. A doctor had concurred that the droppings contained a virus that could be injurious to human health. Pellets left on the window ledge had controlled the problem at one classroom temporarily, but the problem persisted and may affect other classrooms.

"Some children have their heads down on desks as a result of the fumes."

A parent whose children attend school within another Board area passed on correspondence concerning an incident in which paint fumes and the exhaust from a propane gas heater were adversely affecting students. Both resulted from renovation activity in a new wing under construction. The writer indicated that some students suffered nose bleeds, stomach cramps, and vomiting because of the fumes. Hyperactivity and chest pain were also reported. The writer had suggested to his school board that a completely sealed barrier between the new construction and the existing school would be necessary to reduce the hazard.

A submission was received from a parent in Ottawa with two highly chemically sensitive children. Her family has recently moved into a new home built to be as environmentally clean as posible. She is part of a group preparing to make a submission to the Carleton Board of Education concerning pollution in schools and how it relates to chemically sensitive students.

The same writer describes various types of outdoor pollution that affect students' health and learning ability. Of particular concern to her is diesel exhaust from school buses, some of which she says have been observed idling in front of the school for as long as 45 minutes. She tells how students must wind their way through a maze of buses, exposing themselves to lead, carbon monoxide, oxides of sulphur and nitrogen, particulates and many chemicals, some of which are carcinogenic. These substances also pollute the inside of the buses and adjacent playgrounds and often seep into the school buildings, exposing other children to them. The writer recommends that school bus drivers should not leave engines idling while waiting for students, that exhaust pipes on school buses should all be located away from the door, that parents and teachers should teach children to avoid exhaust pipes of all vehicles, and that engines of all other vehicles waiting outside the school should also be turned off.

"As much natural light from windows should be let in. Bright, naturally lit rooms are more conducive to learning."

Herbicide spraying of schoolyards is also dealt with in this presentation. The writer states that 2,4-D is known to have detrimental effects and health hazards of other chemicals haven't been as well studied. She suggests that chemical maintenance of schoolyards should be replaced with non-chemical procedures that pose no health risks and that the public be taught a greater tolerance for weeds.

Another area of concern is the widespread schoolyard use of wooden play structures impregnated with toxic wood preservatives. The writer describes how green, pressure-treated wood is injected with inorganic arsenical compounds, dark-brown railroad ties are treated with creosote, and others are treated with pentachlorophenol. The writer is concerned that children who play on this equipment are absorbing small amounts of the chemicals by skin contact, ingestion, or inhalation. The use of untreated cedar or redwood is encouraged for this type of equipment.

Indoor sources of pollution in schools are also treated in detail in this letter. The writer feels that energy considerations in newer schools often result in lower than ideal amounts of fresh air. Air circulating and ventilating systems are often inadequate, she feels, or have been tampered with, resulting in a build-up of pollutants. If the buildings are heated by oil or gas, according to the writer, combustion products such as oxides of carbon and nitrogen and unburned hydrocarbons are distributed through the building. The suggestion is made that each school should be evaluated individually for ventilation requirements, but until that time, teachers should air out their rooms at regular intervals and minimize the generation of pollutants. She also suggests that schools with forced-air systems should have their ducts vacuum-cleaned periodically.

The writer feels that a policy should be enacted to forbid smoking at anytime inside schools and buses, including staff and groups who use the school facilities outside school hours.

The common practice of painting school buildings with oil-based paint during the school year is of serious concern to this mother. She describes complaints ranging from asthma, nose and eye irritations, headaches, dizziness, nausea, and higher incidence of illness due to increased susceptibility to colds as symptoms resulting from staff and student exposure to paint, mineral spirits and paint thinners. She also states that paints have been found clinically to produce epilepsy-like seizures and cause depression and suicidal tendencies. The solvents are eye, nose and throat irritants and central nervous system depressants. An incident is described where painting was recently halted in one school because a student was very badly affected. The group of parents with which this woman is affiliated will recommend to the school board that painting be done only in the summer.

The writer states that many art and craft supplies used by schools contain solvents that are among the most allergenic of all chemicals affecting the central nervous system. She says that some felt markers cause eye and nose irritations, hyperactivity in some, drowsiness in others, and headaches. She describes how fumes from oil paint used in an art class triggered an immediate attack of asthma in her daughter as she stepped out of her own classroom into a hallway. The asthma attack lasted for two days. She expresses concern about toluene and xylene, common solvents used in art classes that are irritants to the skin and mucous membranes and depressants to the central nervous system. The use of aerosols with fine particles that can remain in the air for up to two hours and can penetrate deep into the lungs should be forbidden in schools, according to the writer. In fact, she recommends that only non-toxic art materials be purchased by boards of education.

"Parents of chemically sensitive students can work on a one-to-one basis with the teacher for the student's specific needs."

Chemicals in science laboratories can also be a major source of indoor air pollution in schools. The writer feels that most labs have inadequate fume hoods and that teachers should sufficiently caution students about the dangers inherent in handling volatile organic solvents.

She also stated that ammonia has been the most common cleaner used in schools, and while it is highly effective, it is also a lung irritant and is known to trigger asthma attacks and headaches. Lysol contains toxic compounds also. Non-odorous biodegradable soap solutions are suggested as a replacement. Pest control chemicals and procedures create a very serious threat to the students because the toxic residues remain for a very long time. Her letter suggests that trapping, general cleaning and isolation are safer methods of pest control. Due to an outbreak of lice in some Carleton Board schools, the schools and buses were fumigated.

Her submission further suggests that when school boards are acquiring such things as carpets, drapes and furniture, they endeavour to purchase materials that will not introduce pollutants into the buildings. The writer describes how new carpeting installed in the auditorium of a Kanata school raised the formaldehyde level in the air to a concentration detectable by smell and caused one child to faint. Carpets also breed molds and collect dust, so their use in schools should be kept to a minimum. Carpet adhesives, plywood and particle-board furniture, some books and printed materials, and carbonless paper often used for report cards are all possible sources of formaldehyde. The writer suggests that if carpets must be purchased, those with lignum-based adhesives rather than formaldehyde-based should be obtained.

Portable classrooms often cause health and learning problems for students. The older ones often contain high levels of formaldehyde, according to this writer. The submission also deals with fluorescent lighting, to which the writer claims some children react adversely. Some people apparently feel drowsy or fatigued, have headaches and lack of concentration, or develop hyperactivity after long exposure to some types of fluorescent lighting.

Suggestions are made to encourage as much natural light as possible into classrooms. Teachers should be encouraged to turn off fluorescent lights for periods during the day, and when replacements are made, they should be of the daylight white type. School boards should initiate double-blind studies on special classes to acertain if full spectrum lighting would help children with learning disabilities, this writer recommends.

Perfume is a major source of pollution in enclosed areas, and the number reacting to it is increasing. The same writer states that teachers, parents and students should be made aware of the effects of perfume smells on some sensitive people and should be encouraged to use non-scented products.

> **"I realize one can't ask teachers not to smoke - a personal prerogative. However, can we honestly expect to teach kids restraint in this way?"**

The parent of a student at Northern Secondary School referred to in a teacher's submission discussed earlier (p. B-5), wrote to describe her daughter's sensitivities in further detail. She states that the winter months are the worst, and that her daughter has difficulty in any large closed, poorly ventilated building. The chemistry laboratory has only one small window up high at the back of the room, and she feels this would not supply adequate ventilation for an allergic child. She suggests that the Toronto Board of Education's energy constraint policy has led to a situation where windows are kept closed in winter, and the only air exchange is to come from the hall door of the classroom.

The same writer also notes that smoking in the teachers' lounge has left the room so contaminated that she could barely stand it during an interview last fall. The odour of tobacco smoke on a teacher's sweater has been sufficient to make her daughter feel ill. An arrangement to allow her daughter use of the nurse's washroom has helped her to avoid the smoke, hair spray and perfume common in the girls' washrooms in the school. Part-time attendance at school may provide an acceptable solution to her daughter's sensitivity to the classroom environment. Experience during exam time in February of this year showed that she felt much better when attending the school only for a short time every second day, despite exam pressure.

> **"According to such visible signs as black 'auras' and hanging black particles, the air vents are very much in need of cleaning."**

A member of the teaching staff at the Scarborough Campus of the University of Toronto indicated that elementary and secondary schools do not have a monopoly on indoor air quality problems. For some time she has been seeking action to rectify indoor air pollution and ventilation problems at Scarborough College. She notes that most staff members have responded to the situation, which is still not satisfactory, by doing as much as possible of their work at home. She cites several cases of cancer and one miscarriage as possibly being related to the school environment. Fumes from the science labs, uncleaned ductwork, general lack of air flow, high carbon dioxide levels, dust, tarring of the roof, are among the situations described in an attached report dated January, 1984.

The same writer describes the result of an informal survey among hundreds of students in classrooms, in the library, and in the cafeteria. Some 80% suffer, at one time or another, from a variety of problems, ranging from sleepiness and poor concentration in hot, stuffy overcrowded rooms to chronic fatigue, constant sore throats, dizziness, eye problems, respiratory problems, headaches, frequent nose bleeds, skin problems and nausea. She urges a truly scientific inquiry before problems become even worse.

> **"While they are trying to 'accommodate' me, there is also constant pressure on me to compromise, to stop 'exaggerating'.**

A writer from California tells of her experience in the child care centre at a large California university. Foam sleeping mats are suspected of triggering asthma attacks, and for making certain children more difficult to wake up after naps. State regulation of curriculum may make it more difficult for the writer to avoid having animals in the classroom. Regulations also require daily disinfecting of the linoleum floors, but the products used trigger exhaustion and asthma. She notes having had little difficulty with a particular brand of carpet which was chosen because it would gas out quickly while she was on leave. It was installed with water based glue. (Unfortunately that type of carpet has since been discontinued.)

> **"The environmental illness of children must be considered as seriously as epidemics of communicable diseases and accorded the same priorities in preventive medicine".**

The Ontario Association for Children With Learning Disabilities (ACLD) sent numerous background reports relevant to the study of pollution and how it affects children. The chairman of the organization's Metal Actions Committee appears confident that susceptible children, once identified, will not be abandoned within the system. She also makes the point that individual susceptibility to lead absorption is not well understood but has been demonstrated and includes copies of studies which can be found in the bibliographic references accompanying this report. The writer also cautions that, although action is desperately needed in this area, premature action may be worse than no action at all. She feels that consultation with competent researchers and clinicians is necessary to resolve areas of disagreement regarding testing procedures, normal ranges, treatment, etc. so that appropriate and adequate policies and action can be put in place.

At a special meeting with the authors of this report on February 26th, 1985, representatives of ACLD also emphasized the need for support to parents and education of parents and teachers about early signs and symptoms of environmentally related problems. Identification of specific procedures to follow, and listing of resource persons that can be contacted would be helpful. They pointed out the difficulties that are faced by parents who can be overwhelmed by the magnitude of the problem when they first discover that their children may be sensitive to environmental factors. A full study of the internal environment of the child and its role in health and learning has been proposed by the Association (see Recommendation 8, page 93). They also suggested that the Board of Education should be very specific in its recommendations and build a review process into any program that may arise out of the present study. (See Recommendations 2a, 8, and 10 on pages 87, 93, and 98 respectively).

A case history was submitted by the Association for Children with Learning Disabilities to demonstrate the improvements that can be achieved when environmental changes are made. They described a boy who was found to be sensitive to many common chemical exposures when he was tested in Grade 5. His school record to that point contained a history of problems. Teachers told his parents that he was slow, that he required individual attention, that he had difficulty retaining facts, was inattentive and disorganized. His moods swung from melancholy to hyper, and his work habits varied accordingly. Psychological services had been called in during Grade 2, and a special behaviour assessment class was considered. Testing showed a sensitivity to the constituents of cleaning compounds, pesticides, deodorants, paints, preservatives, synthetic carpets, glues, volatile markers, and pre-packaged foods. His reactions to such chemical exposures included restlessness, confusion, lack of concentration, grogginess, and elevation of mood.

After the parents began a program of chemical avoidance, diet modification, desensitization and nutritional support, the boy's teacher indicated that there was progress at school, and the behaviour award system previously used was no longer needed. Most of the symptoms he displayed during primary grades began to disappear. His parents noted that he still has a problem with ditto paper, markers, perfumes, some cleaning compounds, and tobacco smoke, all of which are found in or near classrooms, and which continue to affect his behaviour and academic achievement. They emphasize that the single most important factor has been avoidance of exposures. The boy spends some time in the hallway and in other rooms when odours are present in the classroom.

"Learning disabilities may be the result of nutritional deficiencies and food and other allergies."

The Society for Understanding of Nutrition, in Ottawa, Canada submitted a report entitled "Childhood Experiences as Causes of Criminal Behaviour" (L. Gilka, 1978), which was submitted to a Senate Subcommittee on the same subject. The report states that an increasing number of scientists and physicians are now concluding that, in many children, learning disabilities may be the result of nutritional deficiencies and food and other allergies. It also states that there is now evidence of a connection between juvenile delinquency and learning disabilities.

"Recognition of problems, early nutritional education, and awareness of pollution are important solutions."

The Orthomolecular Medical Centre of Toronto sponsored an evening lecture on January 28, 1985 by Dr. Josef Krop, who practises environmental medicine in the City of Toronto. In his presentation, Dr. Krop estimated that 10-20% of children have some problem with learning or with hyperkinesis. He stated that hyperactive children may have the following characteristics:

1) short attention span
2) easily distracted
3) overactive and disorganized
4) dull appearance, daydreaming
5) impulsive
6) emotional problems
7) discipline problems (including either child abused by parent, or parent abused by child)
8) poor co-ordination (including left/right difficulties, clumsy, bumping into things)
9) perceptual changes
10) learning disabilities (including listening, thinking, talking, writing, reading, spelling or arithmetic)

He emphasized that there are many causes for hyperkinesis, but that these do include environmental causes, such as food sensitivity, chemical sensitivity, inhalant sensitivity, and infections such as muco-cutaneous candidiasis (Candida Albicans).

Dr. Krop stated that among the environmental factors encountered in schools which are known clinically to cause problems are painting, indoor use of pesticides, outdoor use of herbicides, odorous cleaning solutions, asphalt paving and roofing, and underground garages. Diesel bus fumes may also leak into schools, or into buses themselves, causing problems for sensitive students. Tobacco smoke, perfume, deodorant, hair spray, hand lotion, shaving lotion, nail polish remover, and makeup are among the personal items that cause problems. Other materials in schools that cause problems include chalk, copy paper, drapes, carpets, correction fluids, paints, and plants. Art, science, and mechanical workshop chemicals may also affect some students and staff.

His recommendations to school boards include:

1) no painting during the school year
2) stop using pesticides
3) install electric heating
4) maintain effective ventilation systems
5) lay safe flooring
6) use safe cleaning solutions
7) use safe teaching materials
8) prohibit use of perfumes and tobacco.

"There do not seem to be any provincial regulations with respect to safety standards for secondary school science laboratories."

The Canadian Council on Children and Youth, of Ottawa, Canada enclosed a summary of a report on the question of safety in school science laboratories (E.R. Rieber, 1984), along with a letter concerning mercury vapour in school laboratories. The report observes that there does not appear to be any systematic monitoring of safety conditions in school science laboratories.

The Canadian Institute of Child Health, also from Ottawa, Canada, expressed concerns about the effects of polluted environments in educational settings. Specific issues mentioned were playgrounds contaminated with lead, the general use of chemicals in school labs, the hazards for children in art supplies, the hazard from solvents in print making and photographic darkrooms, and mercury vapours in science labs. The writer emphasized the need for a set of guidelines or standards for school boards.

Dr. A.S. MacPherson, Toronto's Medical Officer of Health, commented that one of the most significant indoor air pollutants is second hand tobacco smoke. Dr. Trevor Hancock, Toronto's Associate Medical Officer of Health, Northern Area, also pointed out the need to be concerned with persons who are more sensitive than most to pollutants. For example, a small minority of the population have alpha 1 antitrypsin deficiency, and are as a result much more susceptible to tobacco smoke and more likely to develop emphysema. They suggest that a complete ban on smoking in schools would be a good first step.

Michael J. Suess, the World Health Organization's Regional Officer for Environmental Health Hazards in Copenhagen, Denmark, wrote to convey that organization's interest in the Toronto Board of Education's study on pollution and education. He supplied a number of related reports (listed under World Health Organization in Appendix C) and indicated that WHO anticipates continued activity in indoor air quality, leading to the development of guidelines and a better understanding of the impact on human health.

"There is not enough air. Sometimes I get dizzy and I yawn a lot."

West Toronto Secondary School submitted a survey questionnaire with responses from 1003 staff and students. A sample of the questionnaire is shown on the following page. The questionnaire asked the respondents for comments on lighting, heating or air conditioning, air quality and humidity. Respondents also noted the floor and room number where they noticed these problems most. The proportions of respondents who noted environmental problems somewhere in the school are as follows:

lighting	**21%**	(213/1003)
heating/air conditioning	**61%**	(613/1003)
air quality	**25%**	(249/1003)
humidity	**12%**	(124/1003)

The respondents varied in their description of the problem, with some stating that the lighting was too bright, some that it was too dull. The preceding quotation is typical of those who found air quality unsatisfactory. Words such as 'stale' and 'stuffy' were also commonly used by those complaining of poor air quality. Those who noted heating and air conditioning problems commonly noted that it was too hot in some parts of the school, or at some times, and too cold in other parts of the school, or at other times. Dry air was the most common complaint about the humidity level.

A question about allergy was included on the questionnaire, to determine whether those with allergies would note more problems with the school environment. Approximately 17% of the respondents had been told by their doctors that they have an allergy (173/1003). Fifty-three people are taking medication for allergies (approximately 31% of the number of allergic persons). This includes 49 people who have been diagnosed allergic by a doctor and four who have not.

Only 24% of those who felt there was an air quality problem have a diagnosed allergy (60/249). The percentage of allergic people who felt there was an air quality problem was 35% (60/173). Only 23% of non-allergic people felt there was an air quality problem (189/830). The percentage of those who are on allergy medications who felt there was an air quality problem was similar to the percentage of all allergic respondents who noted air quality problems (19/53 or 36% of the people on allergy medication).

There were only slight differences in the responses of allergic and non-allergic people for lighting and humidity, and a small difference for heating and air-conditioning (66% of allergic people noted problems, vs. 60% of non-allergic people). The full comparison is given in the table following. Overall, it can be concluded that while there may be a somewhat larger proportion of allergic than non-allergic people who felt there were environmental problems, the proportion of non-allergic people who reported problems was considerable: 21% for lighting, 23% for air quality and 60% for heating and air-conditioning. **Clearly it is not just the allergic person who is experiencing adverse effects which may be caused by the school environment.**

People Who Feel That There Are Problems With The School Environment At West Toronto Secondary School

	# with allergies noting problems	% of all allergics (/173)	# without allergies noting problems	% of non-allergics (/830)	total noting problems	% of all respondents (/1003)
Lighting	40	23%	173	21%	213	21%
Air Quality	60	35%	189	23%	249	25%
Heat/Air Conditioning	114	66%	499	60%	613	61%
Humidity	23	13%	101	12%	124	12%

WEST TORONTO SECONDARY SCHOOL

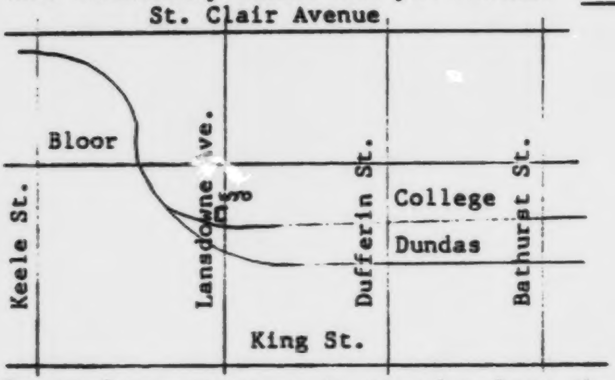
Has your doctor told you that you have an allergy? ____ yes ____ no

How many years ago did you find out you had an allergy? ____

Do you take medication for your allergies? ____ yes ____ no

How old are you? ____

What elementary school did you attend? ____________________



Do you live inside the area shown here? ____ yes ____ no

Do you have any comments to make about the lighting in this school?

____

Do you have any comments to make about the heating/air conditioning in this school?

____

Do you have any comments to make about the air quality in this school?

____

Do you have any comments or observations to make about anything else in the school environment that you like or dislike?

____

If you feel there is a problem in any of the 3 areas above, where do you notice the problem most?

Lighting ____ Floor ____ Rooms ______________

Heat/air conditioner ____ Floor ____ Rooms ______________

Air Quality ____ Floor ____ Rooms ______________

Humidity ____ Floor ____ Rooms ______________

> **"I shudder when I think about what has gone into my lungs in the last twenty-seven years."**

A series of letters was also received from teachers at Wilkinson Junior Public School in Toronto. One teacher sums up one of the major problems at Wilkinson as being an odour that suggested the burning of soft coal or of burning various chemicals. On days when this odour can be detected, he experiences watering eyes, choked up throat, difficulty speaking, and additional effort in climbing stairs. His powers of concentration are noticeably affected, and he experiences mood changes (irritability or depression). Pupils at the school are also aware of the smell. The writer has heard from both parents and teachers about problems people have experienced in the main building of the school.

The writer points to two problems which he feels contribute to the situation. One is the intake by the air circulation system of fumes from garbage being burned. The second is that the ducts appear to be lined with soot. The situation improved somewhat when filters were changed, but the writer notes that his morning routine continues to include taking a damp cloth and wiping the fine black powder off the desks, chairs and books. Increasing frequency of the adverse symptoms prompted the writer to take action to block off the air flow to the classroom and to use classroom windows instead as the primary air source. The quantity of soot dislodged from the duct in the process has reinforced the conclusion that the ducts require extensive cleaning.

Another teacher tells the same story, and reports that on occasion smoke could be seen in the classroom, coincident with times when garbage is being burned in the incinerator. On one occasion children were removed from the classroom because the teachers believed there was a fire in the school.

A third teacher describes the respiratory problems, sinusitis and allergies he has developed, which he feels are a consequence of the dust and smoke pollution within Wilkinson School. His initial health problems began approximately a decade ago during major renovation at the school. Over the following years, he felt better away from the school, and became ill again as soon as he returned. Presently he experiences headaches, sore throat, and double vision. Taping vents with cotton has reduced the accumulation of fine black dust in the room, but he continues to sneeze. The writer emphasizes that past attempts to raise this problem have resulted in no action, and that officials have not appeared concerned. He requests a rapid solution because of his concern about the cumulative effects of such pollution exposures.

The parents of a kindergarten student at Wilkinson feel that the present situation at Wilkinson is a threat to their daughter's health. They suggest that the incinerator is either not being used properly, or it is malfunctioning. Some of their daughter's classmates have experienced symptoms (e.g. runny nose, sore throat) that they feel could be related to the soot in the rooms. An immediate and thorough engineering and health investigation is their recommendation. Another parent states that although her son has allergies, he suffers more while at school, and this has an effect on his thinking.

> **"At times the smell of the burning incinerator is almost choking."**

Two other teachers wrote about their inability to keep up with the accumulation of black dust on the various surfaces in the classroom. One suffers from headaches that start upon arrival at the school, almost every morning. Her students frequently complain of sore throats and itchy eyes.

A common theme in approximately twenty more letters received from Wilkinson School staff is the fact that many feel well away from the school, yet begin to experience symptoms first thing in the morning after arrival at the school. One teacher writes of headaches and a feeling of lethargy leaving no energy to work with the children. She becomes hoarse within two hours after arrival at the school, but does not experience this symptom when away. Others mentioned headaches, sore throats, watery and sore eyes, runny noses, weak feelings, nausea, burning eyes, sneezing, itching, dry nose, irritation with contact lenses, sinus problems, and increased flus and colds. Many Wilkinson staff also reported soiled clothing because of the deposition of black dust within the school.

Despite much discussion, the problem at Wilkinson was still persisting as of February 1985. One teacher indicated that a number of options had been discussed by colleagues, administrators and caretakers. Among the following options, the last was preferred.

a) having the incinerator checked for leaks

b) examining the chimney height to see if an air-draft is dumping smoke down and around the east side of the building

c) having the boiler/incinerator 'stack draft needs' checked to see if the boiler and incinerator can be operated simultaneously

d) make sure the stack temperature is high enough (pre-heated) before garbage is put into the burning chamber

e) eliminate the incinerator altogether and arrange additional waste pickup.

Recommendation 2 in the main body of this report (see page 87) states that it is critically important that the Board develop the skills necessary to 'trouble-shoot' problems such as have been described above at Wilkinson School. Recommendation 3 (page 88) requests the Director of Education to arrange followup contact with those who have responded to this Pollution and Education study. This places the situation described by the teachers at Wilkinson school on high priority for attention and solution.

APPENDIX C

APPENDIX C
DETAILED BIBLIOGRAPHY AND ABSTRACTS

This appendix lists and reviews all the references that are cited in the main body of the report, as well as additional references that were consulted during the study and which had a bearing on the conclusions and recommendations.

Many of the references are available by inter-library loan through the services of local public and university libraries. If readers are having difficulty obtaining what they need through these sources, they are invited to request the assistance of the librarian at the Board of Education for the City of Toronto, 155 College Street, Toronto, Ontario M5T 1P6, (416)-598-4931.

In most instances, further bibliographic information, including ISBN numbers or special report numbers, is available from the computer data bank of the Foundation for Independent Research on Technology and Health, c/o Sunnyhill Research Centre, R.R.#1, Goodwood, Ontario, (416)-294-3531.

References have been listed alphabetically by first author. All authors are indexed in the "Name Index" section, and all keywords as well as other principal words in the abstract have been indexed in the "Subject Index" section of this report.

Ackerman, D.G.; Scinto, L.L.; Bakshi, P.S.; Delumyea, R.G.; Johnson, R.J. (1981). "Guidelines for the Disposal of PCBs and PCB Items by Thermal Destruction". US EPA, Office of Research and Development, Industrial Environmental Research Laboratory; February 1981.

Keywords: pollution; combustion; biphenyl; incinerators; boilers; PCBs

Abstract:

The report is a resource and guidelines document to aid EPA Regional Offices (USA) in interpreting and applying PCB regulations to the thermal destruction of PCBs. It describes fundamental processes of combustion, thermal destruction systems, sampling and analysis methodology and flame chemistry relative to PCB incineration. The report states that commercial thermal incineration units and high efficiency boilers, if operating properly, will achieve greater than 99.9% destruction and will not be sources of PCB contamination of the atmosphere. However, it is stated that previous studies have indicated that fly ash and residues contain PCBs.

American Academy of Environmental Medicine (1984). "18th Advanced Seminar and 19th Annual Meeting: Program". American Academy of Environmental Medicine; 1984. Enquire P.O. Box 16106, Denver CO 80216, (303)-622-9755.

Keywords: nutrition; chemical sensitivity; allergy; yeast; environmental illness; candida albicans; indoor air pollution

Abstract:

The purpose of the meeting was to: inform the participants of the intricate relationships between our diet and nutritional deficiencies, and the effects these have immunologically on the maladapted patient; to inform physicians about the clinical therapy of the chemically sensitive patient; and to update participants on the many facets of ecological therapy.

Andersen, I.; Lundqvist, Gunnar R.; Proctor, Donald F.; Swift, David L. (1979). "Human Response to Controlled Levels of Inert Dust". American Review of Respiratory Disease, Vol. 119, pp. 619-627; 1979.

Keywords: indoor air pollution; health effects; respiratory tract; house dust

Abstract:

The authors studied nasal mucous flow, airway resistance, and subjective response in 16 young healthy subjects during 5 hour exposures to 2, 10, and 25 mg of inert dust per m^3 in an environmental chamber. The dust was fully polymerized plastic dust containing carbon black. The number of these particles in room air, expressed as a per cent of the total number of particles was 36, 41, 14, 7, and 2, respectively, for the aerodynamic size ranges less than or equal to 1.8, 1.9 to 5.3 to 8.9, 9.0 to 12.4, and greater than or equal to 12.5 um. No significant changes in nasal mucociliary clearance rate or nasal resistance were observed. At all dust concentrations there was a decrease in 1-sec forced expiratory volume, but not in the forced vital capacity or the forced expiratory flow during the middle half of the forced vital capacity. The nasal penetration fraction of particles was approximately 55 percent for the smallest particles and 20 percent for the largest. Discomfort was proportional to the concentration of dust, but lagged almost 2 hours behind the changes in dust concentration. The main complaints were dryness in the nose and pharynx.

Anderson, Darrell E. (1971). "Problems Created for Ice Arenas by Engine Exhaust". American Industrial Hygiene Association Journal, No. 32, pp. 790-801; December 1971.

Keywords: carbon monoxide; nitrogen dioxide; engine exhaust; infrared analyzing; ice arenas

Abstract:

Episodes of illness in separate arenas from carbon monoxide and nitrogen dioxide exposures are described. Typical symptoms have been headache and nausea among children and headache among adults. In one episode, symptoms of illness were sore throat and tightness in the chest. Some of the unrecognized effects of low-level carbon monoxide exposure such as disturbance of coordination, judgement, psychomotor tasks, and visual acuity, and marked increases in choice discrimination errors and reaction time, which have been pointed out by recent medical research, are of added concern. Excessive air concentrations of these gases resulted from the operation of ice resurfacing machines. Carbon monoxide concentrations up to 250 ppm following one episode and nitrogen dioxide concentrations up to 40 ppm following the other were found. All 45 ice arenas in Minnesota were visited subsequently to evaluate the variables responsible. Engine exhaust and ambient air data are presented. Infrared analyzer recordings of carbon monoxide concentrations in three arenas are shown. Possible methods of controlling exhaust gas problems are discussed.

Anderson, K.E. (1983). "Interim Report No. 1: East Jackson Middle School". National Institute for Occupational Safety and Health, Centers for Disease Control, Dept. of Health and Human Services, Cincinnati OH 45226; March 1983.

Keywords: school; health hazards; evaluation

Abstract:

In September and October 1982, NIOSH conducted environmental and medical surveys at the East Jackson Middle School in Jackson, Michigan, on the request of the school's teachers. An estimated over 90% of staff members had reported a variety of irritating symptoms, including headache, fatigue, mucous membrane irritation of the eyes, nose and throat, and skin irritation. No evidence was found of any chemical contamination in the school. Results of detector tube samples from the environmental surveys revealed no detectable concentrations of formaldehyde, carbon monoxide or nitrous fumes. Long-term air samples revealed no detectable concentrations of hydrogen sulfide, sulphur dioxide or carbon monoxide. Long-term air samples analyzed by gas-chromatography revealed no detectable concentrations of formaldehyde. Carbon dioxide levels were within normal ranges during both surveys. It was concluded that the complaints of irritant symptoms could be in part related to the school's heating, ventilating and air conditioning system. Recommendations were made for the venting of the spirit duplicating machines and for daily inspection of the rooftop HVAC units. A number of recommendations were also made in connection with the school's faulty and inadequate ventilation system and for installation of a humidification system for the entire school.

Andersson, Rolf; Boman, Carl Axel; Sandberg, Mats (1984). "Indoor Climate Problems in a Kindergarten, And How They Were Solved". Indoor Air, Vol. 3, pp. 335-340; Swedish Council for Building Research, Stockholm Sweden, 1984.

Keywords: indoor air pollution; children; school; ventilation; health hazards; Sweden

Abstract:

Staff in a Swedish kindergarten complained of draughts relating to the ventilation system. Comprehensive measurements of CO2 concentrations and other ventilation performance criteria are presented, with ways to solve the draught problem. The report focuses the need for adequate design guidelines that consider the following factors: thermal comfort, ventilation efficiency, air-exchange efficiency and noise.

Anger, W. Kent (1984). "Neurobehavioral Testing of Chemicals: Impact on Recommended Standards". Neurobehavioral Toxicology and Teratology, Vol. 6, pp. 147-153; 1984.

Keywords: nervous system effects; standards; behavioural toxicology; neurotoxicity

Abstract:

Historically, the American Conference of Governmental Industrial Hygienists has served as a major source of information on recommended safe exposure limits (Threshold Limit Values or TLVs) for chemicals most frequently encountered in industry and of known toxicologic significance. A review of the ACHIH Documentation Book, which details the basis for their judgements, has indicated that 167 of the 588 chemicals for which they assigned recommended standards have, as one of their bases, direct nervous system effects.

Association for Children With Learning Disabilities (1982). "A Case History of An Allergic Child". Association for Children With Learning Disabilities; March, 1982.

Keywords: allergies; chemical sensitivities; anecdotal report; school; pollution

Abstract:

This is a case history, prepared by the child's parents, of a 12 year old boy with severe cerebral allergies. Allergies to phenols, formaldehyde, alcohol, auto exhaust, chlorine, and sugar cane are described, along with accompanying reactions. Reactions range from yawning, headaches and confusion to hyperactivity and difficulty retaining facts. Teacher's comments on behaviour and doctor's recommendations to avoid the contaminants are included.

Ball, Roger; Smith, Roy. "Design Criteria for the Control of Health Hazards in Schools". Alberta Workers' Health, Safety and Compensation, Occupational Hygiene Branch, Edmonton Canada.

Keywords: schools; indoor air pollution; building design

Abstract:

This manual sets basic design criteria for ensuring a healthy working environment and is to be used in the planning of new school facilities as well as the upgrading of old ones. It concentrates on those areas in schools where potentially hazardous conditions are most often encountered. It covers: ventilation, noise, illumination, volatile substance storage, woodworking shops, automotive shops, fine arts, music rooms, science laboratories, changing rooms, general classrooms, and various occupational training areas.

Bardana, Emil J. Jr. (1980). "Formaldehyde - Hypersensitivity and Irritant Reactions at Work and In the Home". Immunology & Allergy Practice, Vol. 11, No. 3, pp. 60-71; May/June 1980.

Keywords: formaldehyde; indoor air pollution; health effects

Abstract:

Formaldehyde is a widely distributed low molecular weight compound which is highly soluble in water and capable of binding and altering human protein. The bulk of this material is used in the production of resin compounds employed as industrial laminates, binders and adhesives. Major exposures occur as a result of off-gassing from a variety of wood products and foam insulation. Potential for disease has been well documented in the skin where it can induce dermatitis by irritation, delayed-type hyper-sensitivity and immediate urticarial reactions. Its capacity to irritate the eyes and upper respiratory tract are well established. Observations to date also incriminate formaldehyde in the induction of an inflammatory bronchitis as well as bronchial asthma.

Bates, David V.; Sizto, Ronnie (1983). "Relationship Between Air Pollutant Levels and Hospital Admissions in Southern Ontario". Canadian Journal of Public Health, Vol. 74, pp. 117-122; March/April 1983.

Keywords: particulate; air pollution; sampling

Abstract:

Published hourly data of measurements of particulate pollution from 15 air sampling stations in southern Ontario and computerized hospital admission for the 79 acute care hospitals in the region were examined.

The months of January, February, July and August in 1974, 76, 77, and 78 were studied to find possible relationships between the two sets of data. For July and August, highly significant associations were found between excess respiratory admissions and SO2 and O3 and temperature, with 24 and 48 hour lags between the variables.

Batts Young, Bambi (1981). "Chemicals That Cloud the Mind". Environment and Behavior, Vol. 1, No.3, pp. 1-3; August 1981; Center for Science in the Public Interest, 1755 S St., NW, Washington DC 20009.

Keywords: chemicals; indoor air pollution; behaviour; health effects

Abstract:

It is not unusual for industrial workers to experience deterioration in behaviour or in mental function after exposure to common industrial chemicals and pesticides. In one instance, researchers investigating the effects of "safe" levels of mercury found that a reliable prediction of certain memory problems could be based on a simple measurement of mercury exposure.

Baxter, D.; Ziskind, R.; Shokes, R. (1983). "Ambient Asbestos Concentrations in California". State of California, Air Resources Board, Sacramento CA 95812; Dec. 1983.

Keywords: asbestos; electron microscopy; braking; air pollution

Abstract:

Measurements of airborne asbestos levels in the inhalable particle range were made at ten sites in California using transmission electron microscopic analysis of cyclone sampler filters. Background asbestos levels were compared with those at locales containing industrial facilities, natural mineralogical sources and heavy traffic braking. Site locations were selected to represent areas of high and low population exposure. Asbestos levels ranged from the analytical detection limit to observable elevations at the braking, industrial and urban sites. Highest asbestos levels were in the vicinity of the Union Carbide asbestos mill at King City. Levels there ranged up to 140,000 fibers/m^3. Concentrations at others sites were below 56,000 fibers/m^3.

Beard, Rodney R.; Wertheim, George A. (1967). "Behavioral Impairment Associated With Small Doses of Carbon Monoxide". American Journal of Public Health, Vol. 57, No. 11, pp. 2012-2022; American Public Health Assoc.; 1967.

Keywords: carbon monoxide; air pollution; air quality standards

Abstract:

Improvement is needed in the methods of setting standards of air quality. In establishing such standards, the effects of various pollutants upon human performance should be considered. Toward this end, the effects of exposure to carbon monoxide upon the ability of 18 young adults to discriminate short intervals of time were studied. Deterioration of performance was observed. This occurred after 90 minutes at 50 ppm, and at proportionately shorter times after exposure to higher concentrations up to 250 ppm. Experiments with rats, using operant behaviour schedules of reinforcement, showed rapid and marked disruption of the ability to judge time, with a significant decrement apparent after 11 minutes exposure to 100 ppm during performance on a DRL schedule. It is suggested that methods derived from experimental psychology can contribute materially to the evaluation and understanding of both gross and subtle effects of CO as an air pollutant and can thereby aid in the formulation of standards of air quality.

Beattie, A.D.; Moore, M.R.; Goldberg, A.; Finlayson, Margaret J.W.; Graham, Janet F.; Mackie, Elizabeth M.; Main, Joan C.; McLaren, D.A.; Murdoch, R.M.; Stewart, G.T. (1975). "Role of Chronic Low-Level Lead Exposure in the Aetiology of Mental Retardation". The Lancet, pp. 589-592; March 15, 1975.

Keywords: lead; water pollution; mental retardation

Abstract:

Water lead levels were measured in the homes occupied during the first year of life by 77 mentally retarded children aged two to six years and 77 non-retarded matched controls, and in the homes occupied by their mothers during pregnancy. The water lead content was significantly higher in the retarded group, and the probability of mental retardation was significantly increased when water lead exceeded 800 ug. per litre. Blood lead levels were also significantly higher in the retarded group. It is concluded that lead contamination of water may be one factor in the multifactorial aetiology of mental retardation and that every effort should be made to reduce the lead content of drinking water.

Bee, Minerva (1981). "New School Brings Health Hazards". Union WAGE, pp. 3-4; January/February 1981.

Keywords: schools; health hazards; indoor air pollution

Abstract:

Students and teachers at a San Francisco high school complained of burning eyes and noses, sore throats, stomach pains, persistant headaches, fatigue, weakness, and difficulty concentrating shortly after the start of school in the Fall of 1980. The symptoms steadily worsened and only occurred during attendance at the school, a modern campus designed to be air tight and energy efficient. A toxicology committee of faculty was formed to investigate the possible health hazards of the building and a team from the Occupational Health Clinic at San Francisco General Hospital administered a health questionnaire to students and staff of this and another control school. It is thought that the closed ventilation system, combined with low levels of airborne chemicals in synthetic materials used in the building's construction, such as formaldehyde found in insulating materials, particle board furnishings, carpets, etc. could be causing the health problems.

Befekadu, F. (1984). "The Effect of Environmental Strain Upon Students' Comfort and Work Performance". Indoor Air, Vol. 5, pp. 349-353; Swedish Council for Building Research, Stockholm Sweden, 1984.

Keywords: environmental strain; students; work performance; indoor air pollution; thermal pollution; noise pollution; visual pollution;

Abstract:

Extensive investigations have been made in the past in order to provide a healthy and comfortable living and working indoor environment. This paper discusses the effect of thermal, visual and noise environments upon the health, comfort and work performance of students engaged in sedentary activity in the classroom. The investigation was carried out in two different buildings of different orientations and surroundings which offered varied environmental conditions. Suitable subjective criterias and corresponding scales expressing different subjective responses in terms of numerical values were used. Physical measurements on thermal, visual and noise environments were taken and simultaneous subjective assessment of 40 acclimatised subjects was made. Assessment results indicate a marked relationship between the physical measurements and the corresponding subjective assessment and also revealed that there were no marked interactions between the personal life of the subjects and the thermal, visual and noise environments.

Bell, I.R. (1982). "Clinical Ecology". Common Knowledge Press, Box 316, Bolinas CA 94924; 1982.

Keywords: clinical ecology; environmental illness; health hazards; pollution

Abstract:

Practitioners of clinical ecology maintain that a broad range of common physical and psychological disorders can be triggered in susceptible individuals by chronic and often low-level exposures to foods, environ-

mental chemicals, and natural inhalants, with emphasis on the first two. Low doses of substances which singly might be benign may interact additively or synergistically on some common pathways in the body to produce illness, with the onset of illness depending on the total stress load, including all of the psychosocial, physical, chemical, antigenic or infective stressors that impinge on the individual.

Bellinger, David C.; Needleman, Herbert L.; Leviton, Alan; Waternaux, Christine; Rabinowitz, Michael B.; Nichols, Margaret L. (1984) "Early Sensory-Motor Development and Prenatal Exposure to Lead". Neurobehav. Toxicol. Teratol., Vol. 6, No. 5, pp. 387-402; 1984.

Keywords: human studies; prenatal exposure; lead; aging; sensory motor development

Bender, W.; Gothert, M.; Malorny, G.; Sebbesse, P. (1971). "Effects of Low Carbon Monoxide Concentrations in Man". Archives of Toxicology, Vol. 27, pp. 142-158; 1971.

Keywords: carbon monoxide; psychological effects; law of mass action; air pollution

Abstract:

In experiments on healthy volunteers 19 to 34 years of age seated quietly in a closed chamber of 1.5 m 3 capacity continuously circulated with a mixture of air and CO, the uptake and psychological effects of carbon monoxide during and after exposure were investigated. On the basis of tests carried out on a random sample of 42 students, it could be shown that carbon monoxide inspired in a concentration of 100 ppm for 2 1/2 hours resulted in a statistically significant diminution of visual perception, manual dexterity, ability to learn and perform certain intellectual tasks. At this time, the measured CO concentration in alveolar air was 55 ppm and the COHb level was 7.2%.

Berglund, B.; Johansson, I.; Lindvall, T. (1982). "A Longitudinal Study of Air Contaminants in a Newly Built Preschool". Environment International, Vol. 8, No. 1/6; 1982; Pergamon Press, Oxford, Toronto; 1982.

Keywords: indoor air pollution; preschool; Sweden; air pollution

Abstract:

In about 100 newly built preschools in Stockholm, staff and children have reported medical symptoms that are associated with bad air quality, such as dry throat, irritation of eyes and lips, hoarseness, hacking cough and itching. The air quality in one such preschool was

investigated in a longitudinal study. Typical air contaminants emanating from building materials were determined, their variation over time (0-18 months) was measured, and the influence of the ventilation system on contaminant concentrations was studied. The study shows that all the organic compounds decline in concentration mainly within the first 6 months of occupancy. A preschool building needs to be gassed off during the first six months after its construction with no recirculation of return air allowed. During at least 1 to 2 additional years, it is desired that the recirculation rate of return air is restricted, perhaps to 50%.

Berk, James V.; Hollowell, Craig D.; Pepper, James H.; Young, Rodger A. (1980). "The Impact of Reduced Ventilation on Indoor Air Quality in Residential Buildings". University of California; Lawrence Berkeley Laboratory, Energy and Environment Division, Berkeley CA; March 1980.

Keywords: residence reduced ventilation; air pollution; energy efficient; indoor air pollution; air quality; carbon monoxide; energy conservation; evaluated data; filtration; formaldehyde; graphs; ground water; health hazards; nitrogen dioxide; radon; urea-formaldehyde foams

Abstract:

The levels of air contaminants inside buildings are often higher than ambient outdoor levels. Interest in conserving energy has been motivating home-owners and builders to reduce infiltration rates in residential buildings and builders to reduce ventilation rates in institutional amd commercial buildings. However, the resulting decrease of indoor/outdoor air exchange will tend to increase the concentration of many indoor air pollutants. Three indoor contaminants - nitrogen dioxide from gas stoves, formaldehyde from particleboard and urea-formaldehyde foam insulation, and radon from various building materials - are currently receiving considerable attention in the context of the potential health risks that are associated with reduced infiltration and ventilation rates. It is likely that some increased health risk will accompany an increase in indoor contaminant expposure; hence, it is desirable not to allow these concentrations to rise above human tolerance levels. There are several possible ways of circumventing increased health risks without compromising energy conservation consideratiions.

Bertell, Rosalie (1984). "Handbook for Estimating Health Effects From Exposure to Ionizing Radiation". Institute of Concern for Public Health, 67 Mowat Avenue, Suite 343, Toronto, Ontario M6K 3E3.

Keywords: ionizing radiation; cancer; teratogenic effects; plutonium;

Abstract:

This handbook contains information which enables the translation of human radiation exposure levels into probable health effects, for example, a labour union faced with evaluating a list of worker radiation exposures, or a physician deciding on the risks and benefits of various X-ray procedures. Some radioactive materials emit rays which can penetrate the body even though the materials remains outside. The most common are gamma-ray and X-ray emitters. Some beta particles are able to penetrate the outer skin layer and do some internal damage to humans. When radioactive particles are taken within the body through inhalation or ingestion, they can do more severe local biological damage to the cells immediately surrounding the bone, organ or tissue in which they lodge.

Berwick, Donald M.; Komaroff, Anthony L. (1982). "Cost Effectiveness of Lead Screening". New England Journal of Medicine, pp. 1392 to 1398; June 1982.

Keywords: lead; screening; blood levels; children

Abstract:

Lead screening programs may reduce childhood disabilities, but at what cost? Through a review of the literature, the authors performed a cost-effectiveness analysis in which the costs, savings, and health benefits of two lead screening strategies were compared with each other and with a strategy of no screening in a population of three-year-old children. When the prevalence of lead poisoning among the children screened is 7 percent or more, it is estimated that free screening averts morbidity and results in net savings: it is both better and cheaper than no screening. At all prevalence rates, free erythrocyte protoporphyrin screening is the most cost-effective type.

Birks, A.; Ellis, E.; Erb, J.; and Whiteside, T. (1985). "South Riverdale Lead Control Issues". Toronto Dept. of Public Health, Eastern Health Area. February 20, 1985; Including covering letter March 19, 1985 from A. S. Macpherson, M.D., Medical Officer of Health to Dr. E. N. McKeown of the Board of Education for the City of Toronto.

Keywords: lead; South Riverdale; soil replacement; nutrition supplement program;

Abstract:

This report describes the history of the soil replacement studies and action taken in South Riverdale to remove lead-contaminated soil, and reviews other current studies on lead uptake. At a meeting March 19, 1985, the Board of Health endorsed recommendations contained in the report, and also directed that the Medical Officer of Health request the Minister of the Environment not to delay in replacing soil in areas where soil lead levels are above 1,000 ppm., and that soil replacement not be contingent upon the results of the blood lead testing.

Bischof, W.; Banhidi, L. (1984). "Investigation on Dynamic School Climate". Indoor Air, Vol. 5, pp. 309-313; Swedish Council for Building Research, Stockholm Sweden, 1984.

Keywords: indoor temperatures; indoor air quality; student performance

Abstract:

The optimal and permissible limit values of indoor temperatures associated with the mental performance of students have been the subject of tests for several years all over the world. This problem is of great importance economically. It is necessary to know the temperature limit values of the room and the influence of these values on the mental performance of the students. The results of a simulation test, made at the Hungarian Institute for Building Science, are elaborated in this paper.
(See also p. 45).

Blackwood, T.R.; Archer, S.R. (1979). "Status Assessment of Toxic Chemical: Asbestos". US Environmental Protection Agency, Industrial Environmental Research Lab., Office of Research & Development, Cincinnati OH 45268; Dec. 1979.

Keywords: asbestos; fibers; nonmetalliferous mineral deposits; pulmonary fibrosis; air pollution; respiratory disease; health effects

Abstract:

This report outlines the mining, milling, uses and health effects of asbestos. Its major applications are in cement products, floor tiles, electrical equipment, brake linings, and flame resistant compositions. Impaired human health from industrial exposure to asbestos is well known. Additional information is needed on the effects of low level asbestos concentrations in air and water. Present control technologies, regulations, and major sources of pollution are reported and areas where information is needed are indicated.

Blume, Kathleen A. (1976). "Air Pollution in the Schools". from Clinical Ecology, Lawrence D. Dickey ed; chapter 39; pp. 369-376; Charles C. Thomas; 1976.

Keywords: indoor air pollution; schools; health hazards; ventilation; chemical susceptibility

Abstract:

There are many sources of indoor air pollution in our schools. Many children are reacting to a toxic exposure when they become irritable, excited, depressed, unreasonable or antisocial. Many children who demonstrate an inability to learn, who are slow learners, who have reduced reading comprehension and speed, reduced memory, or who show mental confusion, could be satisfactory students if there were no toxic fumes present in their school environment. The major causes of air contamination in schools are found to be aerosol sprays, janitorial supplies, scholastic supplies, building materials and furnishings, heating, ventilating and cooking equipment, cosmetics and toiletries, smoking and school buses.

Bock, Fred G.; Repace, James L.; Lowrey, Alfred H. (1982). "Nonsmokers and Cigarette Smoke: A Modified Perception of Risk". Science, Vol. 215, p. 197, January 8, 1982.

Keywords: tobacco smoke; health hazards; passive smoking; indoor air pollution

Abstract:

Discussion of an article by Repace and Lowrey in Science 208, p. 464, 1980 evaluating the exposure levels of nonsmokers to cigarette smoke.

Boegman, R.J.; Bates, L.A. (1984). "Neurotoxicity of Aluminum". Can J Physiol Pharmacol, No. 62, pp. 1010-1014; August 1984.

Keywords: neurological disorders; aluminum; pollution; health effects; behaviour

Abstract:

The toxic effects of aluminum, the earth's most abundant metal, on the nervous system are reviewed. Soluable Al salts can be absorbed from the stomach; nutritional deficiencies of calcium and magnesium can enhance Al absorption. Al is deposited in the gray matter of the brain and affects many neuronal processes: it stimulates protein synthesis, inhibits axonal transport, and increases the breakdown, while decreasing the re-uptake, of neurotransmitters. Behavioural consequences may include memory loss, impaired motor coordination, decreased learning ability, psychotic reactions, and seizures. Common sources of Al include antacids, deodrants, paper towels, drinking water (Aluminum sulfate is used in water purification), airborne dust, and food. High levels of Al in soil, and acid rain, which can leach Al from the soil, increase the level of Al and tend to decrease the amount of selenium in locally grown plants.

Bokina, A.I.; Eksler, N.D.; Semenenko, A.D.; Merkur'yeva, R.V. (1976). "Investigation of the Mechanism of Action of Atmospheric Pollutants on the Central Nervous System and Comparative Evaluation of Methods of Study". Environmental Health Perspectives, Vol. 13, pp. 37-42; National Institutes of Health; 1976.

Keywords: air pollution; acetone; benzene; ammonia; formaldehyde; ozone; central nervous system; behaviour

Abstract:

Some aspects of the mechanism of action of atmospheric pollutants (acetone, benzene, ammonia, formaldehyde and ozone) on the central nervous system were studied by using methods of functional electroencephalography. Effects of the compounds were determined for the various structures of the cerebral cortex of experimental animals. The most sensitive structures were those which were first to associate in the reaction to toxic agents. EEG indices were observed which were indicative of an adverse effect. During long-term action of toxic materials at low concentrations, changes were observed in the parameters of the primary and secondary responses of the visual evoked potential which were indicative of a disturbance of the cortical inhibition processes. This can be considered one effect of atmospheric pollutants at low concentrations.

Bonham, Gordon Scott; Wilson, Ronald W. (1981). "Children's Health in Families with Cigarette Smokers". American Journal of Public Health, Vol. 71, No. 3, pp. 290-293; March, 1981.

Keywords: children; cigarettes; respiratory health

Abstract:

Recent studies have indicated higher rates of certain respiratory conditions among children who live in households with adults who smoke cigarettes. This paper analyzes data from the 1970 National Health Interview Survey. Children in families with no smokers had an average of 1.1 fewer restricted activity days and 0.8 fewer bed disability days per year than did children in families with two smokers. Children in families with one smoker were in between. Acute respiratory illness accounted for the difference in disability days among children in families with different smoking characteristics. Family smoking was also measured by the combined number of cigarettes smoked by adults; children in families which smoked 45 or more cigarettes a day had 1.9 more restricted activity days and 0.9 more bed disability days due to acute respiratory conditions than did children in families who did not smoke cigarettes. The age of the child, the number of adults in the family, the education of the family head, and the family income were all controlled and did not eliminate the relationship between children's health and family smoking.

Borrows, Peter; Turner, Richard (1984). "How Safe is Science in Schools?". New Scientist, No. 13, pp. 12-15; September 1984.

Keywords: schools; science classrooms; health hazards; occupational safety

Abstract:

Safety regulations for school science labs are going unobserved for lack of funds. But school is the ideal place to instill a lifelong awareness of potential hazards.

Bozzelli, Joseph W.; Russell, Joel F. (1981). "Airborne Asbestos Levels in Several School Buildings Before and After Bulk Asbestos Removal". Intern. J. Environmental Studies, Vol. 20, pp. 27-30; 1982.

Keywords: asbestos; removal; schools; air pollution; insulation

Abstract:

Airborne particulate samples were collected in several public schools before and after friable asbestos-containing (5-20 percent) insulation material had been removed from the ceiling areas. Transmission electron microscopy with selected area electron diffraction (SAED) was used for fiber identification and counting. Asbestos fiber concentrations in the air were in the range 5-40 ng/m^3 before removal of the friable asbestos ceiling insulation. The airborne asbestos concentrations approximately one week after removal showed reductions of 56 to 90 percent.

Brobeck, Stephen; Averyt, Anne C. "The Product Safety Book". The Consumer Federation of America, Washington DC.

Keywords: hazardous chemicals; formaldehyde; germicides; disinfectants; pressed wood; indoor air pollution

Abstract:

A wide variety of hazardous products and materials are described, including formaldehyde in building materials and disinfectants.

Byers, Randolph K.; Lord, Elizabeth E. (1943). "Late Effects of Lead Poisoning on Mental Development". American Journal of Diseases of Children, Vol. 66, No. 5, pp. 471-494; American Medical Association; November 1943.

Keywords: lead; air pollution; central nervous system; children; learning ability

Abstract:

Early lead poisoning has an effect on the growth and development of the infantile nervous system. Documented observations show that of 20 children with mild lead poisoning in infancy, only 1 has progressed satisfactorily in school. None of the children exhibited striking evidence of encephalopathy during their primary admission, and all were adjudged to have made a complete recovery from lead poisoning when discharged from the original hospitalization. The length of the cycle of ingestion, storage and elimination of lead in relation to the relatively short duration of the symptoms and signs allowing a diagnosis of lead poisoning is emphasized.

Calabrese, E.J. (1978a). "Pollutants and High-Risk Groups: The Biological Basis of Increased Human Susceptibility to Environmental and Occupational Pollutants". John Wiley & Sons, New York, 1978.

Keywords: susceptibility; standards; environmental health; pollutants; risk factors;

Abstract:

To be at high risk with respect to a pollutant, an individual would experience the adverse health effects of the pollutant significantly before the general population because of some genetic, developmental, nutritional, physiological, behavioural, psychological, or disease state factors present which predispose the individual to the harmful effects. The author stresses that at present, the identification and especially the quantification of the numbers of individuals at high risk in the population in question is still in its rudimentay stages. The question addressed is: what percentage of the population is actually being protected from the toxic or carcinogenic activities of a pollutant, by clean air standards.

Calabrese, E.J. (1978b). "Methodological Approaches to Deriving Environmental and Occupational Health Standards". John Wiley & Sons, New York, 1978.

Keywords: standards; pollutants; occupational health;

Abstract:

This work discusses the methodological bases for deriving pollutant exposure standards, with particular reference to the fact that there is a high degree of variability in the response of humans to different levels of air pollutants.

Calabrese, E.J. (1980). "Nutrition and Environmental Health: The Influence of Nutritional Status on Pollutant Toxicity and Carcinogenicity; Volume 1 - The Vitamins, and Volume 2 - Minerals and Macronutrients". John Wiley & Sons, New York, 1980.

Keywords: nutrients; pollution; sensitivity; risk;

Abstract:

This two-volume work discusses the complex interaction of nutrition and pollutants on human health, itemizing research results which reveal the positive and negative effects of vitamins, minerals and other nutrients on a person's sensitivity to the adverse effects of pollutants.

Campbell, J.S.; Day, James; Clary, John J.; Kinloch, David; and Golberg, Leon; (1981). "Final Report of the Department of National Health and Welfare Expert Advisory Committee on Urea-Formaldehyde Foam Insulation". Department of National Health and Welfare, Ottawa, Canada, April 1981.

Keywords: urea-formaldehyde foam insulation; allergy; cancer; irritation;

Abstract:

The Committee declared that compared to other building materials, UFFI is an unstable material which deteriorates, and the rate of deterioration is dependent on the conditions to which it is exposed. Degradation results in the release of formaldehyde gas which can be carried to the living space by air leakage. Where the cavity containing the foam has not dried properly after installation, fungus growth may occur leading to possible structural and health problems.

The Committee noted the role of formaldehyde as a potential carcinogen, and irritant, and a potential allergen affecting skin and ocular and nasal mucous membranes as well as the lungs. They note that some individuals may become highly responsive to low doses leading to debilitating dermatitis, rhinitis, conjunctivitis and asthma. Superimposed on these health considerations is the likelihood of respiratory sensitization from exposure to fungal spores. The Committee states that it is not prepared to recommend any level of formaldehyde exposure that it safe. UFFI was banned under the Hazardous Products Act, Section 8b.

Campbell, K.L; George, E.L.; Washington, I.S. Jr. (1980). "Enhanced Susceptibility to Infection in Mice After Exposure to Dilute Exhaust from Light Duty Diesel Engines". from Health Effects of Diesel Engine Emissions, Vol. 2; pp. 772-785; Pepelko, W.E., Danner, R.M., Clarke, N.A., editors; US Environmental Protection Agency, November 1980.

Keywords: diesel exhaust; susceptibility to infection, streptococcus; nitrogen dioxide;

Abstract:

A series of experiments was conducted in which groups of mice were first exposed for various durations to diluted exhaust from light duty diesel engines and then briefly to an infectious aerosol generated by nebulizing cultures of a bacterial pathogen (streptococcus). Typically, post-infection mortality was significantly greater in groups exposed to exhaust than in their corresponding control groups exposed to purified air only. Data of recent diesel and of past diesel- and catalyst-treated gasoline engine exhaust experiments suggest a somewhat greater excess mortality from (and enhanced susceptibility to) bacterial infection in mice exposed to diesel exhaust than in those exposed to catalytic gasoline exhaust. Limited data on acute tests of NO2 and acrolein vapour alone suggest that the infectivity-enhancing effect of diesel exhaust could be accounted for in large part by these components. Exposures to diesel exhaust, NO2, or acrolein did not enhance the mortality of a viral pathogen.

Canadian Association for Children and Adults with Learning Disabilities (1984). "A Brief on Emission Control Standards". Canadian Association for Children and Adults With Learning Disabilities, Kildare House, 323 Chapel, suite 101, Ottawa Canada K1N 7Z2; September 1984.

Keywords: learning disabilities; automobile exhaust; lead; brain development; children; carbon monoxide; Association for Children With Learning Disabilities

Abstract:

This submission focuses on the effects of auto emissions on child health, specifically concerning their potential for adverse effects on brain development and function. Minimal brain dysfunction affects an estimated 10 to 15% of the population today. Lead emissions from cars are one of the major causes. Carbon monoxide is a known teratogen and another component of automobile exhaust that should be better regulated. Acid precipitation and leaching of heavy metals such as mercury, cadmium and aluminum which are known neurotoxins is another major problem which should be better monitored.

Canadian Environmental Law Association (1984). "Spotlight on PCBs". CELA Newsletter, Vol. 9, Issue 2/3, June/August 1984, pp. 60-62; Canadian Environmental Law Association, 243 Queen St. W., 4th floor, Toronto Canada M5V 1Z4; 1984.

Keywords: polychlorinated biphenyls; environment; health effects; burning

Abstract:

A general description of PCBs and their release into the environment by burning is presented. Health problems are presented: PCBs have been proven to be carcinogens in laboratory animals and reproductive damage in fish and birds has been documented. In 1968 a severe incidence of human contamination occurred in Japan, resulting in 16 deaths and several still births. As well, victims suffered lesions, blindness, hearing loss, chloracne, inflamation of the joints, liver damage, behavioural changes and subsequent birth defects. Testing indicated that PCBs were transmitted in utero from mothers to their fetuses and to infants via breast milk. Canadian regulation of PCBs is also described.

Caplinger, K.J.; and Green, Mayer A. (1985). "'Allergic to Everything': 20th Century Syndrome". Little Rock, AR, and University of Pittsburgh School of Medicine. JAMA, Vol. 253, No. 6, Feb. 8, 1985, p. 842 (Questions and Answers).

Keywords: total allergy syndrome; twentieth-century disease; chemical allergy;

Abstract:

Dr. Caplinger raises the question as to whether "total allergy syndrome" exists. He notes reports in the literature claiming that some patients who are exposed to an environmental agent, usually chemical, have immune alterations based on this exposure and become "allergic to their environment". They have a variety of symptoms, usually subjective, that respond poorly to medications. Dr. Green replies that the subject is a "hot potato", and that being "allergic to everything" is becoming a more common complaint. He notes that total allergic syndrome does not exist as a 'clinical entity', but that people do exist who complain of such problems and they do need help. He notes that regarding environmental control, we are limited to what can be done in the home, and states that treatment of total allergy syndrome is inadequate, because complete avoidance of incitants is impossible, traditional medications are insufficient, and 'desensitization' is, at best, controversial.

Carey, John (1985). "Beware 'Sick-Building Syndrome'". Newsweek, pp. 58-60; January 1985.

Keywords: indoor air pollution; health hazards; formaldehyde; radon; tobacco smoke; bacteria; carbon monoxide; benzene; styrene; California

Abstract:

Study after study has discovered that air inside homes, schools and office buildings can be laden with a variety of chemicals, gases, smoke, bacteria and other pollutants - sometimes in concentrations high enough to pose serious threats to health. Students in a California high school suffered from headaches, sore throats and fatigue from formaldehyde at 1.45 ppm coming from new particleboard shelves in the school library. Carbon monoxide gas and passive tobacco smoke are two of the most serious and common indoor pollutants.

Carson, Bonnie L.; McCann, Joy L.; Ellis, Harry V. III; Herndon, Betty L.; Baker, Larry H. (1981). "Methanol Health Effects". Environmental Protection Agency; December 1981.

Keywords: toxicity; methanol; acyclic alcohols; mammals; bibliographies; toxic tolerances; occupational diseases; respiratory system; air pollution

Abstract:

Health effects literature primarily related to inhalation exposure to methanol was collected, evaluated, tabulated, and summarized. Approx. 160 documents were collected from computerized and manual literature searches covering the period 1901-1980. Pharmacologists and an MD epidemiologist rated the documents according to their applicability to the study and their methodology. The approximately 25 documents considered useful for deriving a range of concern for human exposure to methanol from automotive emissions were tabulated. The pages of tables detail the results of acute, repeated dose, and chronic testing of mice, rats, rabbits, dogs, monkeys and humans as well as human occupational studies. A brief summary of oral and skin absorption toxicity is included. Most of the documents evaluated are described in an annotated bibliography.

Cesario, J.F.; Chiljean, R.A.; Smith, A.R.; Logue, E.E. (1981). "Identifying Potential Asbestos Exposures in Schools: The New York City Experience". US Govt.; June 1981.

Keywords: asbestos; schools; air pollution; exposure; field tests; lab equipment; sampling; assessments; surveys; indoor air pollution; New York City; air pollution effects (humans)

Abstract:

This report describes the experience of the New York City Board of Education and their asbestos-in-schools program. The objectives of the program were to: identify current and potential asbestos exposures in NYC public schools, evaluate the seriousness of these exposures, recommend appropriate abatement action and oversee the completion of the recommended action. A survey of all school buildings was completed and priority problem areas were identified. Major abatement activities were scheduled for summer recess periods and completed as funds became available.

Chicago Sun Times (1981). "School Allergy May Be No Joke". Chicago Sun Times, August 1981.

Keywords: school; indoor air pollution

Abstract:

Dr. Leonard Caputo, an allergist from Mobile, Alabama, is quoted as saying that allergy to school could be easily classified as an occupational hazard due to the large number of allergenic and irritating materials to which students are exposed. In a paper prepared for the annual Congress of the American College of Allergists, Caputo cites dust, chalk dust, industrial waxes, cleaners, felt-tipped markers, carpets, and mold in libraries as being some of the substances that cause poor school performance.

Chisolm, J. Julian (1974). "Heavy Metal Exposures: Toxicity From Metal-Metal Interactions, and Behavioral Effects". Pediatrics, Vol. 53, No. 5, Part 11, pp. 841-842; May 1974.

Keywords: mercury; cadmium; lead; air pollution; health hazards; behavioural effects

Abstract:

The extent to which pediatric exposure to a heavy metal contributes to the body burden of that metal must be considered. There is an important interaction between metals, including the essential ones, creating greater health hazards than would exposure to the metals individually. Thus the susceptibility of the young child to heavy metals may be related to diet, or the intake of protein, calcium or iron. Added to this is his or her rapid growth, which may be considered a stress factor. Recently there have been fewer children with acute disorders due to lead absorption; rather, it seems that children with infantile autism and other disabilities after normal development up to age 3 are occurring in greater numbers. In these cases, elevated blood lead levels were present and it is quite possible that their chronic increased lead absorption contributed to the behavioural disorders. They suggest that the role of lead should be considered in a wide variety of central nervous system disorders.

Christie, Alan (1983). "Junction Dwellers Promised Relief From Foul Odours". Toronto Star, January 20, 1983.

Keywords: air pollution; Toronto; health effects

Abstract:

People who live in Toronto's Junction Triangle area experience stomach cramps, violent headaches, sore throats, dizzy spells, eye irritation and rashes from the noxious fumes from some of the neighbourhood's 20 factories, chemical plants, lumber yards and rubber manufacturers. A Citizen's Watchdog Committee asked City Council's Executive Committee for action and the Medical Officer of Health promised a full-scale study of the area.

Citizen Patriot (October, 1984). "Every School in U.S. Can Join Asbestos Suit". Jackson Citizen Patriot, p. A-9; October, 1984.

Keywords: asbestos; regulation; air pollution; schools

Abstract:

Virtually every elementary and secondary school in the US can join an almost $1 billion class-action suit against manufacturers to recover the cost of removing deadly asbestos from school buildings, a US District Court judge recently ruled. This is the first nationwide class action suit for property damages on a products liability issue and will automatically include 36,000 public and non-profit private schools that have been ordered by the government to test for asbestos. It will try to recover punitive and compensatory damages to pay for the testing and removal programs.

Citizen Patriot (May 15, 1984). "Toxic Pen Recalled in Texas". Jackson Citizen Patriot, May 15, 1984.

Keywords: art supplies; chemical pollution; schools; health hazards

Abstract:

A paint-filled marker pen containing a toxic chemical which school children were sniffing has been voluntarily recalled from Texas stores because it was not properly labelled.

Cohen, Janet (1984). "Mancelona Schools to Join Asbestos Lawsuit". The Record-Eagle, section 3; Traverse City Michigan; October 3, 1984.

Keywords: asbestos; schools; removal; Michigan

Abstract:

A local school district, facing about $90,000 in costs to remove asbestos-containing materials from its high school, intends to join a nationwide class-action suit against the manufacturers of the materials.

Colgan, Michael (1982). "Your Personal Vitamin Profile". William Morrow & Co. Inc., New York NY; 1982.

Keywords: learning disabilities; nutrition; pollution; toxicity

Abstract:

Many learning disabilities respond favourably to simple changes in nutrition and elimination of pollutants from the child's environment. IQ levels can also be similarly improved.

Collishaw, Neil E.; Kirkbride, John; Wigle, Donald T. (1984). "Tobacco Smoke in the Workplace: An Occupational Health Hazard". Canadian Medical Association Journal, p. 131; November 1984.

Keywords: tobacco smoke; second hand smoke; indoor air pollution; occupational health; health effects; cancer

Abstract:

Tobacco smoke, which contains over 50 known carcinogens and many other toxic agents, is a health hazard for nonsmokers who are regularly exposed to it while at work. Involuntary exposure to tobacco annoys and irritates many healthy non-smokers. Serious acute health effects are probably limited to the one fifth of the population with pre-existing health conditions that are aggravated by exposure to tobacco smoke. The consequences of long-term exposure include decreased lung function and lung cancer. Existing air quality standards for workplaces do not directly specify an acceptable level for tobacco smoke. The evidence on the composition of tobacco smoke and on the health hazards of involuntary exposure suggests that there may not be a safe level for such exposure.

Committee on Indoor Pollutants, National Academy of Science (1982). "Indoor Pollutants". US Govt.; March 1982.

Keywords: environmental surveys; public health; houses; schools; public buildings; formaldehyde; radon; asbestos; microorganisms; moisture; monitoring; humans; air pollution control; standards; air pollution control equipment; indoor air pollution; air quality; tobacco smoke

Abstract:

This report is intended to characterize the quality of the indoor environment - primarily with respect to airborne pollutants, although others are discussed - and to determine the potential adverse health effects of indoor pollutants. The charge was to review, compile, and appraise the available knowledge. The Committee has also identified the research needed for abatement of indoor pollution. "Indoor" refers to the environments in homes, schools, and public buildings.

Cooper, W. Clark (1973). "Indicators of Susceptibility to Industrial Chemicals". Tabershaw-Cooper Associates, Berkeley CA. Journal of Occupational Medicine, Vol. 15, No. 4, pp. 355-359; April 1973. Reprint requests: Tabershaw-Cooper Assoc., Inc., 2180 Milvia St., Berkeley CA USA 94704. Presented at the American Industrial Hygiene Conference, San Francisco, May 16, 1972.

Keywords: pollution; toxic chemicals; hypersusceptibility;

Abstract:

Individuals differ in their susceptibility to toxic agents and other environmental stresses. All individuals do not react similarly, nor do lower animals, when exposed to toxic agents. Some individuals show effects at concentrations which do not affect the majority, while at the other end of the dose-response curve there are individuals who are unusually resistant. Terms like idiosyncrasy or hypersusceptibility have been used to describe, but not explain, extreme deviations in the direction of lack of resistance.

Corwin, Alsoph H. (1976). "Heavy Metals in Air, Water, and Our Habitat". from Clinical Ecology; Dickey, Lawrence D., ed.; Chapter 28; pp. 292-306; Charles C. Thomas; 1976.

Keywords: mercury; cadmium; lead; hypersensitivity; toxic metals; health effects; air pollution

Abstract:

These metallic elements poison living organisms mainly by inactivation of enzymes depending upon sulfhydryl groups. Air and food are polluted with mercury, cadmium and lead. Mercury poisoning causes nerve, brain and kidney damage. Cadmium poisoning mostly affects the kidneys, liver and red blood cells. The symptoms of acute lead poisoning are gastrointestinal. Chronic lead poisoning affects the nervous system, including the brain.

Cotter, J.E.; Johnson, R.J. (1981). "Facilities Evaluation of High Efficiency Boiler Destruction of PCB Waste". US Environmental Protection Agency, Office of Research & Development, Washington DC 20460; March 1981.

Keywords: air pollution; chlorine aromatic compounds; biphenyl; waste disposal; PCBs; yellow grease disposal

Abstract:

The report gives results of an evaluation of destruction in two different high-efficiency boilers of waste found to be contaminated by PCBs from a transformer leak. At the first boiler, logistics and fuel handling requirements were found to be feasible to set up in a short time; boiler size and residence time were determined to be likely to allow high destruction efficiency; with 99.9% destruction of PCBs, downwind concentration was estimated to be less than CSHA limits for industrial exposure.

Croft, Nancy (1984). "Foiling Allergies at Work". Nation's Business, p. 56; September 1984.

Keywords: indoor air pollution; health hazards; office environment; allergic rhinitis; hay fever

Abstract:

The source of many allergies and asthma can often be found in the workplace. Pollens, the hay fever allergens, are harbored in the office in in common dust. Moulds may thrive in the cooling coils of air conditioning units.

Crook, William G. (1978). "Clinical Study on the Relationship of Diet to Hyperactivity, Emotional, Behavior and Learning Problems". Conference Presentation; Nov. 1978.

Keywords: hyperactivity; learning disabilities; food allergies; behaviour

Abstract:

During 1973, the author kept a roster, by means of clinic records and questionnaires, of every patient with learning or behaviour problems and hyperactivity. 70% of these patients experienced a definite relationship of diet to hyperactivity, as determined by improvements of the symptoms on elimination of suspected foods, and flareup on challenge with identification of the specific foods causing the problem. The substances causing hyperactivity in the most children were: sugar, food additives such as colours (especially red), preservatives and flavourings, hot dogs, soft drinks, ice cream, milk, corn, chocolate, egg, wheat, and potato.

Crosby, Ernest C.; Argento, V.K. (1982). "Environmental Concentration of Lead in the Area of Secondary Lead Smelters and a Battery Manufacturing Plant in Dallas, Texas". Air Pollution Control Association Proceedings, Vol. 4; 1982.

Keywords: lead; air pollution; health hazards; children

Abstract:

The US Environmental Protection Agency sponsored a project to examine the concentrations of lead in the environment around secondary lead smelting operations and a battery manufacturing plant. It was of particular interest to examine areas where children would be expected to be exposed to the metal. Concentrations of lead were evaluated at private residences, elementary school playgrounds, parks, and day-care centres. Sampling locations were selected in areas downwind for the prevailing wind directions and a reference area away from known industrial lead use operations but similar in traffic density and socio-economic structure. The soil, 28-day dustfall and window sill and refrigerator dust wipe samples in the area surrounding the secondary lead smelter contained significant levels of lead concentrations. The areas surrounding the battery manufacturing plant did not seem to be affected.

Cummins, J.E. (1981). "Production of NitrosoBagyon from Baygon in NO2 Gas I. Identification of NitrosoBaygon". Pesticides Division, Health and Welfare Canada; December 1981.

Cummins, J.E. (1982). "NitrosoBaygon Formation in Nitroglen Dioxide Gas". Envir. Mutagenesis, No. 4, pp. 337; 1982.

Cummins, J.E. (1982). "Production of NitrosoBaygon from Baygon in NO2 Gas II. Formation of NitrosoBagyon at Low NO2 Levels". Pesticides Division, Health and Welfare Canada; August 1982.

Cummins, J.E. (1982). "Production of Nitrosopiperazines on Exposing the Fungicide, Triforine, to NO2 Gas". Pesticides Division, Health & Welfare Canada; August 1982.

Dadd, Debra Lynn; Levin, Alan S. (1982). "A Consumer Guide for the Chemically Sensitive". Nontoxic Lifestyles Inc., 450 Sutter, suite 1138, San Francisco CA 94108; 1982.

Keywords: chemical sensitivities; consumer guide; chemicals; health hazards; indoor air pollution; immuno-toxic

Abstract:

Many daily processes can cause health problems for the chemically sensitive. Commercial inks and papers, certain types of reproduction processes, as well as various types of school and art supplies can give off immunotoxic fumes and cause reactions in susceptible individuals.

Dahl, Alan R.; Hadley, William M. (1983). "Formaldehyde Production Promoted by Rat Nasal Cytochrome P-450-Dependent Monooxygenases with Nasal Decongestants, Essences, Solvents, Air Pollutants, Nicotine, and Cocaine as Substrates". Lovelace Biomedical and Environmental Research Institute, Inhalation Toxicology Research Institute, Box 5890, Albuquerque NM 87185. Toxicology and Applied Pharmacology, No. 67, pp. 200-205; 1983.

Keywords: formaldehyde; decongestants; solvents; pollutants; nicotine; nasal enzymes; metabolism;

Abstract:

The results of this study indicate that a variety of materials which often come in contact with the nasal mucosa can be metabolized to formaldehyde by nasal enzymes. The released formaldehyde may influence the irritancy of inhaled compounds and it has been suggested that it may play a role in the tumorigenicity of some compounds. Thirty-two potential substrates for cytochrome P-450-dependent monooxygenases were screened with rat nasal and, for comparison, liver microsomes. Tested substrates included 6 nasal decongestants, cocaine, nicotine, 9 essences, 3 potential air pollutants, and 12 solvents.

Five substrates, namely, the solvents HMPA and dimethylaniline, cocaine, and the essences dimethyl anthranilate and p-methoxyacetophone, were metabolized to produce formaldehyde at rates exceeding 1000 pmol/mg microsomal protein/min. by nasal microsomes. Eight subtrates, including four nasal decongestants, nicotine, and an extract of diesel exhaust particles, were metabolized to produce formaldehyde at rates of 200 to 1000 pmol/mg microsomal protein/min. Five other substrates were metabolized to formaldehyde at detectable rates.

Damstra, Terri (1978). "Environmental Chemicals and Nervous System Dysfunction". The Yale Journal of Biology and Medicine, No. 51, pp. 457-468; 1978.

Keywords: air pollution; health hazards; nervous system; occupational; environmental; mercury; kepone; organo-phosphates; ketone; lead

Abstract:

Subtle, subclinical effects may result from chronic low-level exposures to many chemicals. The nervous system may be particularly vulnerable to many of these exogenous chemicals. Selective damage to particular areas of the nervous system has been noted with numerous toxins, and certain groups, such as the young and the elderly, may be especially vulnerable. Selected examples of associations between nervous system diseases and exposures to occupational and environmental chemicals such as inorganic and organo-lead compounds, elemental, inorganic and organo-mercury compounds, kepone, organo-phosphates, n-hexame and methyl-n-butyl ketone, have been reviewed.

Daniell, Harry (1976). "Try Not to Exhaust Yourself". Runner's World, Vol. 11, No. 9, pp. 54-55; September 1976.

Keywords: carbon monoxide; air pollution; health effects; running

Abstract:

Carbon monoxide from automobile exhaust, paint and varnish removers, certain prescription medications such as Phenobarbitol and Dilantin, and cigarette smoke can negatively effect the distance runner in a number of ways. Commonly encountered carbon monoxide concentrations interfere with endurance performance for many hours after exposure to the gas has ended. Breathing air containing 50 ppm of carbon monoxide at rest causes the concentration in the bloodstream to rise to 5% in five hours. But during vigorous exercise, this level of air pollution can produce a level of 5% in less than one hour. This limits oxygen transport to muscle tissue by 5%. It is not metabolized but must be dissipated by being exhaled.

Davis, Karen (1985). "Biochemical Individuality, Nutrition, and Learning Disabilities". Department of Biochemistry, College of Medicine, University of Tennessee, and the Association for Children with Learning Disabilities Foundation. Inquire University of Tennessee, Centre for the Health Sciences, Memphis, TN 38163. Supported by a grant from the ACLD Foundation.

Keywords: learning disabilities; nervous system dysfunction; etiology; nutrition; prevention;

Abstract:

Learning disabilities, a heterogenous group of entities of multiple causes are, in the most basic sense, an expression of underlying central nervous system dysfunction. This shows up as specific deficits in perceptual, integrative, or expressive processes which severely impair learning efficiency. A myriad of causes has been proposed such as genetic constitution, prematurity, complications of pregnancy, labour or delivery, metabolic disorders, malnutrition, infectious disease sequelae, trauma and chronic illness. This paper concentrates on nutrition as a factor which plays a relevant role in the development of, and perhaps in the prevention of learning disabilities.

De Leuw Cather, Canada, Ltd. (1984) "Environmental Overview Study for Railway Lands Steering Group". Railway Lands Steering Group, City Hall, Toronto, November 1984.

Keywords: railway lands; environment; noise; vibration; air quality; climate; water pollution; soil toxicity; soil phytotoxicity; accident risks;

Abstract:

This study presents an overview of the present and predicted environmental conditions in the Railway Lands in Toronto during a time period when it will be transformed from primarily railway yards to a blend of commercial, industrial, residential and open space land uses. The development is expected to take place on a block by block basis over the next 30 years. The report concludes that the Railway Lands are minimally different from nearby sites and other areas within the core of Toronto, in terms of environmental contraints. The authors assert that development would improve the overall environmental quality of the area. (See further discussion on pp. 70,71).

Dewar, Elaine (1984). "Inside the Junction Triangle". Toronto Life, pp. 33-64; July 1984.

Keywords: Junction Triangle, Toronto; air pollution; industrial pollution; health hazards

Abstract:

This is an environmentally and politically oriented report on the history of the public and governmental concern over the air quality of Toronto's highly industrialized Junction Triangle area.

Dickey, Lawrence D. (1976). "Clinical Ecology". Charles C. Thomas, Springfield IL; 1976.

Keywords: clinical ecology; therapeutic and diagnostic techniques; air pollution; toxic substances; environmental hazards; chemical sensitivities

Abstract:

Clinical Ecology is concerned with adverse reactions to environmental insults modified by individual susceptibility in terms of specific adaptation. The outcome of the interreaction of excitants versus host is modified by the host's individual susceptibility which is governed by genetic background, present state of physical and mental well-being, and the individual's ability to adapt. Chemical contaminants, pesticides, herbicides, additives, vehicles, and excipients that are to be found in the air, water, food, drugs and our habitat are dealt with in this publication, with specific reference to diagnostic and therapeutic procedures, avoidance procedures, and detailed explanations of the susceptibility mechanism.

Dodge, Russell (1982). "The Effects of Indoor Pollution on Arizona Children". Archives of Environmental Health, Vol. 37, No. 3, p. 151; May/June 1982.

Keywords: indoor air pollution; tobacco smoke; cooking fumes; health effect

Abstract:

The respiratory health of a large group of Arizona school children who have been exposed to indoor pollutants - tobacco smoke and home cooking fumes - is reported. A significant relationship was found between parental smoking and symptoms of cough, wheeze, and sputum production. Also, children in homes where gas cooking fuel was used had higher rates of cough than children in homes where electricity was used. No differences in pulmonary function or yearly lung growth rates occurred among subjects grouped by exposure to tobacco smoke or cooking fuel. Thus, parental smoking and home cooking fuel affected cross-sectional respiratory symptom rates in a large group of Arizona school children. Study of pulmonary function, however, revealed no lung function or lung growth effects during 4 years of study.

Dravnieks, A.; Whitfield, J. (1971). "Gas Chromatographic Study of Air Quality in Schools". American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE); 1971.

Keywords: indoor air pollution; school; Chicago

Abstract:

The components of air samples in three Chicago area schools were studied by means of organic vapour collection devices and sample transfer analysis techniques. Sensory odour evaluations combined with the use of a gas chromatograph were also used. One school has an old plenum heating system, while the other two had individual heating or air conditioning units in each room. Outdoor air quality and air samples taken after passage through the intake and/or filtering units were sampled at the same time. Frequently, the data demonstrated the presence of contaminants at levels not sufficient to cause odours. It was also found that outside air quality was a major factor in odour quality in the schools. The air supply systems, at least during initial heating periods, contributed additional organic vapours, not necessarily contributing to odour. Occupancy, mustiness caused by dampness in the air-conditioned school, and cafeteria activity, all produced distinct deterioration in air quality, discernible in terms of the gas chromatographic indicators.

Dreistadt, Steve. "Poisoned Playground".

Keywords: playground equipment; health hazards; arsenic; pentachlorophenol; wood preservatives

Abstract:

Arsenic and pentachlorophenol-treated playground equipment may pose a serious health hazard to children who can receive doses of these wood preservatives in excess of the adult occupational safety standards. The City of Berkeley California has found that sealers can reduce arsenic levels in wood playground equipment 100-fold.

Dudney, C.S.; Walsh, P.J. (1981). "Report of Ad Hoc Task Force on Indoor Air Pollution". US Govt.; April 1981.

Keywords: energy conservation; indoor air pollution; aerosols; asbestos; biological effects; carbon monoxide; data compilation; environmental impacts; formaldehyde; government policies; human populations; nitrogen dioxide; occupational safety; organic compounds; pollution sources; public health; radon; recommendations; research programs; residential buildings; reviews

Abstract:

This Ad Hoc Task Force on Indoor Pollution has reviewed information on indoor air pollution and the potential impact on human health of energy conservation measures. The Task Force concluded that: the indoor environment is likely to include exposure to radon daughter nuclides, formaldehyde, carbon monoxide, nitrogen dioxide, respirable particulates and asbestos, as well as other undefined pollutants; indoor exposure may constitute 80-95% of the total exposure for some pollutants; some energy conservation measures reduce the rate of exchange between indoor and outdoor air; reduced air exchange can lead to increased indoor levels of some pollutants; increased indoor pollutant levels lead to increased exposure and increased risk of health impact.

Ehrlich, Richard (1966). "Effect of Nitrogen Dioxide on Resistance to Respiratory Infection". Life Sciences Research Division, IIT Research Institute, Chicago, IL USA. Bacteriological Reviews, Vol. 30, No. 3, Sept. 1966, p. 604-614.

Keywords: infection, nitrogen dioxide; resistance; susceptibility; stress;

Abstract: The effects of exposure to nitrogen dioxide on man and on animals are confined almost exclusively to the respiratory tract. With increasing dosage, the progressive effects of this gas are: odour perception, nasal irritation, difficulty in breathing, acute respiratory irritation, edema and death. Experimental and epidemiological data pertaining to nitrogen dioxide effects in man are sparse, especially in the low concentration level found in community air pollution.

The work reported in this paper suggests a more sensitive indicator of biological effects of nitrogen dioxide, namely, a synergistic effect or secondary effect, demonstrated by reduction in resistance to infection. A single 2-hr. exposure of Swiss albino Webster strain mice or of inbred mice to 3.5 ppm of nitrogen dioxide before or after respiratory challenge with aerosol of K. pneumoniae significantly increased mortality. Continuous exposures to 0.5 ppm for 3 months or longer as well as intermittent daily exposures over a 30-day period produced the same effect in mice. The author cautions that extrapolation to humans is speculative only.

Ehrlich, Richard; Findlay, J.C.; Fenters, J.D.; Gardner, D.E. (1977). "Health Effects of Short-term Inhalation of Nitrogen Dioxide and Ozone Mixtures". Environmental Research; No. 14, pp. 223-231; 1977.

Keywords: nitrogen dioxide; ozone; synergy; air pollution

Abstract:

The effects of single and multiple daily 3-hour exposures to nitrogen dioxide (1.5 to 5.0 ppm) and ozone (.05 to .5 ppm) mixtures on the resistance to streptococcal pneumonia were investigated. It is suggested that a synergistic effect might be present upon repeated inhalation of pollutant mixtures, that make them more effective in reducing resistance to respiratory infection.

Elinson, Lynn (1984). "Analysis of Health Status in the Neighbouring Areas of the Junction Triangle". City of Toronto Dept. of Public Health; September 1984.

Keywords: Junction Triangle; epidemiological study; health effects; air pollution;

Abstract:

This study resulted from the results of a study by Dr. Walter O. Spitzer, entitled "A Study of the Health Status of Residents of the Junction Triangle, Toronto", in which health status was examined in the city's highly industrialized Junction Triangle, a comparison census tract and in the census tracts adjacent to the Junction Triangle. For certain health

status indicators it appeared that these indicators occurred more often or at higher levels in the adjacent areas compared to either the Triangle or comparison areas, while the Spitzer report only made statistical comparisons between the two latter tracts. The Spitzer data concerning this adjacent area was therefore re-examined and compared statistically with the comparison census tract data and the conclusion that there is not a major health problem in the area was cautiously drawn.

Ely, Daniel L.; Mostardi, Richard A.n; Woebkenberg, Nancy; Worstell, Dawn (1981). "Aerometric and Hair Trace Metal Content in Learning-Disabled Children". Environmental Research, No. 25, pp. 325-339; 1981.

Keywords: learning disabilities; cadmium; selenium; arsenic; mercury; lead; air pollution; children

Abstract:

Children in the 4th to 6th grades at 2 schools were studied and divided in a control group and a learning disability group. The following trace metals were analyzed in the air at the two schools and the children's hair: cadmium, selenium, arsenic, mercury, and lead. Learning disabled females had elevated selenium and lower diastolic blood pressure as compared to the controls. Learning disabled males had elevated selenium and cadmium and lower systolic and diastolic blood pressure and mercury as compared to controls. It is shown that although there was a positive correlation between air and hair, lead, mercury, and selenium, the absolute values were well below federal standards. The data suggest that there is a significant difference between learning disabilities and control trace metal hair content and blood pressure, but that the air is not a major source of this effect although it does add to the cumulative trace metal hair content.

Environmental Protection Agency (U.S.) (1981). "PCB Disposal by Thermal Destruction". US Environmental Protection Agency Region 6, Dallas TX 75270; June 1981.

Keywords: incineration of PCBs; polychlorinated biphenyls; Texas

Abstract:

This is a report on the sampling, analysis, and consideration of risks and benefits associated with the incineration of PCBs at two commercial facilities in Deer Park, TX and El Dorado AK. Included are a summary, PCB incineration test reports, PCDD and PCDF emission sampling reports, a PCDD and PCDF analytical chemistry report, air dispersion modeling results, an analysis of risks and benefits, and letters and conditions of approval. Although computer modelling indicates that significant levels of tetrachlordibenzo-p-dioxins (TCDD) and tetrachlorodibenzofurans (TCDF) would occur in the air of the residential communities surrounding the incinerator stacks, the conclusion was made that incineration is superior to the alternative landfilling or chemical disposal methods.

Environmental Protection Agency (U.S.), Control Action Div., Office of Toxic Substances (1979). "School Asbestos Program - Questions & Answers". US Environmental Protection Agency, Washington DC; April 1979.

Keywords: asbestos; schools; USA

Abstract:

This booklet contains questions and answers designed to inform education and health officials as well as parents and students about the EPA's School Asbestos Program.

Fein, Greta G.; Schwartz, Pamela M.; Jacobson, Sandra W.; Jacobson, Joseph L. (1983). "Environmental Toxins and Behavioural Development". American Psychologist, Vol. 38, No. 11, pp. 1188-1197; November, 1983.

Keywords: indoor air pollution; susceptibility; behaviour; toxicity; lead; methyl mercury; PCBs; children; chemically-induced illness

Abstract:

Childhood exposure to chemicals routinely encountered in the environment has become an issue of scientific and public concern. Recent research has revealed the inadequacy of traditional notions in which chemically-induced illness was likened to overt biological disease. The new multiple-effects model emphasizes subtle behavioural alteration as an early sign of toxicity and as evidence that a particular chemical agent may produce long-term impairment in susceptible individuals. For instance, a case is cited where a group of children who had been hospitalized for overt lead poisoning were evaluated using psychometric tests. Of the 19 children for whom IQ scores were available, 17 scored better than 80. This rather mild retardation was typically accompanied by emotional lability, difficulty in concentrating, and poor school performance. Of the six children whose IQ scores ranged from 95 to 106, only one did well in school. The permeability of the placenta to a variety of chemical agents and the special sensitivity of the fetus to some of these agents draws attention to prenatal exposure and the need for prospective longitudinal studies of affective, social, and cognitive development in exposed individuals. Chemicals discussed in this paper are lead, methylmercury and PCBs.

Feingold Assoc. (1981). "Feelin' Good Naturally". The Feingold Association of the Washington Area, Washington DC 20021; 1981.

Keywords: food additives; hyperactivity; children; nutrition

Abstract:

This packet contains list of foods that have been researched, tested, and successfully used by families whose children are hyperactive when fed chemical food additives of various kinds. It describes in detail the Feingold diet and how to use it as well as how hyperactivity can be caused in the sensitive individual by harmful chemicals in foods.

Ferris, B.G. Jr.; Speizer, F.E.; Bishop, Y.M.M.; Spengler, J.D. (1979). "Effects of Indoor Environment on Pulmonary Function of Children 6-9 Years Old". American Review of Respiratory Disease, No. 119 (4 pt 2), p. 214; 1979.

Keywords: air pollution; sulphur dioxide; nitrogen dioxide; mass respirable particulate; parental smoking; children

Abstract:

A study was conducted into the type of fuel used for cooking in the home. Indoor levels of mass respirable particulate (MRP), sulphur dioxide (S0 2) and nitrogen dioxide (N0 2) were monitored in homes using different cooking fuels. Results of pulmonary function in the various cities in 6 to 9 years olds were analyzed. It was found that the pulmonary function is lower in those children who live in homes where gas is used for cooking as compared with electricity. Households with no air conditioning tended to have children with lower levels of pulmonary function than those households with partial or central air conditioning. These findings suggest that models taking into account effects of air pollution should include the characteristics of the indoor environment.

Ferris, Benjamin G. (1970). "Effects of Air Pollution on School Absences and Differences in Lung Function in First and Second Graders in Berlin, New Hampshire, January 1966 to June 1967". American Review of Respiratory Disease, Vol. 102, pp. 591-606; 1970.

Keywords: air pollution; school children; lung function

Abstract:

Absences from the first and second grades of seven elementary schools in Berlin New Hampshire USA were studied from January to June 1966 and from September to June 1967. Air pollution measurements were made during most of these periods. School absences were not significantly different between schools despite considerable differences in levels of pollution.

Measurements of pulmonary function during the second period did show significant differences that could have been due to exposure to air pollution.

Finberg, Laurence (1974). "Interaction of the Chemical Environment with the Infant and Young Child". Pediatrics, Vol. 53, No. 5, Part II, pp. 831-836; May 1974.

Keywords: chemicals; children; educational environment

Abstract:

Chemical products and by-products of our society have special implications for infants and children, because maturation and growth processes are often qualitatively or quantitatively different from mature systems and because the infant and child have different environments from adults. In turn the effects may be immediate or delayed, and they may have profound effects on the organism at different points in life. Finally, it would appear advisable to encourage both close epidemiologic surveillance and careful research on the effects of known pollutants. In particular, the tools of modern cell biology and molecular biology may have useful application to these problems.

Finkel, A.S.; and Duel, W.C., editors (1976). "Clinical Implications of Air Pollution Research. American Medical Association. Publishing Sciences Group, Inc., Acton, MA, USA; McAinsh & Company, Ltd., 1835 Yonge Street, Toronto Canada M4S 1L6. Air Pollution Medical Research Conference December 5-6, 1974.

Keywords: air pollution; cardiovascular disease; respiratory disease; children;

Abstract:

This proceedings document describes the state-of-the-art at the time of the conference on the relationship between air pollution and cardiovascular and respiratory illnesses. Highlights include a number of chapters on carbon monoxide and cardiac performance (Ch. 9, Edward Haak, Ch. 10, D.A. DeBias), effects on immune defenses and asthma (Ch. 12, G.M. Green), and clinical implications of air pollution research for hypersensitivity diseases (Ch. 15, R.E. Smith). Chapter 16 (R.I. Henkin) discusses the effects of vapour phase pollutants on nervous system and sensory functions.

Fleishman, Jane (1984). "There's Something in the Air...". Working Mother, pp. 114-118; October 1984.

Keywords: indoor air pollution; women; office environment; health hazard

Abstract:

Occupational health experts, health professionals, working women's organizations, unions and clerical workers themselves have begun to pay close attention to the health hazards of the office workplace. Such things as low-level exposure to various office chemicals, including those used in office machinery, to artificial lighting, to inadequate ventilation, to high noise levels and to low-level radiation, are all being looked at as health hazards creating actual sickness and stress.

Fradkin, L.; Barisas, S. (1982). "Technologies for Treatment, Reuse, and Disposal of Polychlorinated Biphenyl Wastes". Argonne National Laboratory, Argonne IL 60439; January 1982.

Keywords: PCBs; disposal; incineration; chemical conversion

Abstract:

Chemical conversion of PCBs to environmentally acceptable by-products is seen as desirable. Several technologies are being developed. Additional disposal technologies were assessed, including chemical waste landfills, incineration at sea, and incineration in high-efficiency boilers. Mobile incineration units, not completely in commercial use at time of writing, are also briefly described. No environmental or health assessments are made.

Fredericks, Carlton (1976). "Psycho-nutrition". Grosset & Dunlap, 1976.

Keywords: allergies; hyperactivity; psychological disturbances; hypoglycemia; learning problems; diet; vitamin therapy; nutrition

Abstract:

Common allergies to food and environmental pollutants can produce the symptoms of hyperactivity, paranoia, neuroses, and other psychological disturbances. Hypoglycemia can cause symptoms of acute psychosis. These problems can be caused by nutritional deficiencies and can, in turn, be alleviated by mega-vitamin treatment by treating their biological causes.

Gaudert, P.C. (1985). ""Briefing Paper on the Status of DBR Research on Contaminant Emissions from Wood-Based Composition Boards". Unpublished. Enquire P. C. Gaudert, Division of Building Research, National Research Council of Canada K1A 0R6.

Keywords: emissions; formaldehyde; composite; particleboard; urea;

Abstract:

Wood based composite boards bonded with urea-formaldehyde (UF) resin - especially particleboard and interior type plywood grades - have become one of the most widely used base materials for interior construction and furnishings. Such board can introduce about 50 to 150 g. of resin for each cubic metre of air in the living space. A yearly release of as little as one to two percent of the formaldehyde contained in the resin into the air of moderately "tight", i.e. energy efficient, homes can cause the ambient concentrations to exceed the recommended 0.1 ppm limit for formaldehyde. A surplus of formaldehyde from the manufacturing process and a slowly decreasing generation of formaldehyde from hydrolysis result in an exponential emission decay with a half-life of about three to five years, i.e. the emission will decrease by half in this time.

Simulation of emissions from samples of representative, unfinished board, using dynamic chambers, have indicated that an unrestricted flow of emissions can cause ambient indoor concentrations to approach 1 ppm. In practice this concentration is usually not reached because of the diffusion resistance introduced by various surface finishes, stagnant air layers or the restriction of flow due to enclosures such as cupboards and closets.

General Accounting Office, Community and Economic Development Division (1982). "Asbestos in Schools: A Dilemma". US Govt.; August 31 1982.

Keywords: asbestos; schools; hazardous materials; carcinogens; risk; minerals; state government; local government; toxic substances; air pollution control; health risks; indoor air pollution

Gibson, Bonnie (1985). "Spotlight on Cadmium". Canadian Environmental Law Association Newsletter, Vol. 10, No. 1, pp. 10 -13; February 1985.

Keywords: cadmium; occupational health; pollution

Abstract:

Cadmium is a naturally-occurring heavy metal that increasingly is being released into the environment as a result of human activity. It is a highly toxic substance with no known biological function and cannot be destroyed by any environmental process. It is produced as a by-product of zinc manufacturing. The major source of exposure is inhalation in the industrial setting and as a result of accidental releases from chemical and electro-plating plants. Another source of exposure is through food and tobacco, both as a result of soil uptake of naturally-occurring cadmium as well as fertilizer residue. Concentrations of cadmium are considerably higher in passive tobacco smoke than to the smoker. Canadians, on an average, exceed the World Health Organization's suggested maximum permissible dietary intake level of .07 milligrams per person per day. Health effects can be lung damage and kidney damage or failure. A lethal dose is possible without warning due to lack of discomfort at the time of exposure. It accumulates in tissues and its chemical half-life can be as high as 30 years.

Gilbert, Susan (1984). "Hazards of the Toxic Office". Science Digest, p. 24; August 1984.

Keywords: sick building syndrome; indoor air pollution; offices; health hazards;

Abstract:

Indoor office air pollution and the resulting health problems have become a major issue. The problem is aggravated by closed vents, sealed windows and other energy-saving measures. The worst offender is ambient cigarette smoke. Copiers and computer screens, plastic furniture and vinyl carpet, fluorescent lights and air conditioners, press boards and particle boards, as well as the building's actual design all contribute to the problem. Lawsuits could eventually arise over environment-induced illnesses.

Gilka, L. (1978). "Childhood Experiences As Causes of Criminal Behaviour". The Society for the Understanding of Nutrition, Ottawa ON K2B 5W6; April 1978.

Keywords: behaviour; food additives; chemical exposures; pollution; learning disabilities; orthomolecular therapy; behaviour toxicology

Abstract:

An increasing number of scientists and physicians are now concluding that, in many children, learning disabilities may be the result of nutritional deficiencies and food and other allergies. There is now also evidence of a connection between juvenile delinquency and learning disabilities.

Ginnetti, Tini; Olmstead, Bob (1984). "Roach-killer Fumes Fell 25 in City School". Chicago Sun-Times, p. 12; February 15, 1984.

Keywords: schools; pesticides; health hazards; indoor air pollution

Abstract:

25 Students in an Illinois high school were taken to a hospital after being exposed to a roach-killing pesticide spread around a swimming pool and hallways. Headaches, dizziness, fainting, blurred vision, shortness of breath and nausea were the symptoms experienced by the students. The school had been sprayed when it was closed on a Monday holiday with Knox Formula 3-11. The pesticide's active ingredient is Baygon, but the manufacturer and Illinois Environmental Protection Agency blamed the ill effects on fumes from the petroleum distillate solvent in which the poison is dissolved.

Globe and Mail, Toronto (February 8, 1985). "School Board Looks Skeptically at Site Near Source of Pollution".

Keywords: railway lands; diesel exhaust; noise; dangerous cargo; lead; sulphur dioxide; industrial emissions;

Abstract:

Diesel exhaust and noise from the nearby Gardiner Expressway and railway, the transportation of potentially dangerous cargoes by train, and lead, dust and sulphur dioxide emissions from industrial plants pose serious problems for any school proposed for the railway lands area. The article discusses the Toronto Board of Education's position on a City of Toronto proposal to build a school near Toronto Refiners and Smelters Ltd., a battery and lead refinery plant near Bathurst and King Sts.

Globe and Mail, Toronto (May 7, 1985). "Kitchener Classroom for Allergic Students 'the first in Canada'".

Keywords: low-pollution classroom; hypersensitivity

Abstract:

This article describes in detail the plans for a special low-pollution classroom at Kitchener Collegiate Institute in Kitchener, Ontario. The classroom will accommodate about eight students this fall, preventing their exposure to substances that provoke symptoms ranging from severe headaches to exhaustion. The school's principal, Harry McCosh, stated that the classroom will be cleaned with non-offensive cleansers, and scented felt pens will be replaced with non-scented, non-toxic writing materials. Teachers will be encouraged not to wear perfume, scented hair spray, deodorants or other scented cosmetics that could cause negative reactions in extremely sensitive students.

Godish, Thad (1981). "Formaldehyde and Building-Related Illness". Journal of Environmental Health, Vol. 44, No. 3, pp. 116-121; November/ December 1981.

Keywords: review; formaldehyde; air pollution; disease

Abstract:

The apparent association between building-related illness and formaldehyde contamination of indoor environments is reviewed. In addition to results of field investigations, emphasis is placed on formaldehyde's toxicity, its possible carcinogenicity and apparent association with asthma. Specific problems associated with mobile homes, wood-frame housing, new school buildings and offices are also discussed.

Godish, Thad (1984). "Indoor Air Pollution - Offices and Other Public Access Buildings". Natural Resources Notes, No. 8; Fall 1984.

Keywords: indoor air pollution; health hazards; sick building syndrome

Abstract:

Within the last decade there have been hundreds of reported outbreaks of illness among occupants of new or recently remodelled offices, schools, and other public access buildings. These outbreaks have characteristically affected a large number of individuals, in some cases 30-40% of the building's population. Illness symptoms are usually of a non-specific nature often including headaches, dizziness, unusual fatigue, eye, nose and throat irritation, chest tightness and shortness of breath. The building materials and lack of ventilation are often the cause, but furnishings, office equipment, maintenance materials, accidental spills of chemicals, cross contamination from outside, tobacco smoke and microbial contaminants can also be at fault. Investigation procedures and mitigation measures are discussed.

Golos, Natalie; Golbitz, Frances Golos; Leighton, Frances Spatz (1979). "Coping With Your Allergies". Simon & Schuster; 1979.

Keywords: allergies; chemical sensitivities; clinical ecology; pollutants; health hazards

Abstract:

Using clinical ecology principles, this book describes the sensitization process, provides information to help diagnose allergies and isolate their causes, recognize health problems caused by hidden allergies, and set up a safe environment for those susceptible individuals.

Green, G.H. (1979). "Field Studies of the Effect of Air Humidity on Respiratory Diseases". Danish Building Research Institute, Copenhagen Denmark; 1979.

Keywords: humidity; children; adults; respiratory health

Abstract:

Studies have been undertaken of the effect of increasing indoor relative humidity on respiratory diseases. Kindergarten children, schoolchildren, soldiers and office workers were studied. The groups were split into rooms that were identical except for differing levels of humidity. There were significantly lower absenteeism and/or occurrences of respiratory illnesses in the spaces with the higher humidities. Increased winter relative humidity of 8 to 10% in the 22 to 50% range reduced the absenteeism from 10% in adults to 50% in kindergarten children.

Green, K.B.; Pasternack, B.S.; Shore, R.E. (1982). "Effects of Aircraft Noise on Reading Ability of School Age Children". Archives of Environmental Health-CISTI; Vol. 37, No. 1, pp. 24-31; 1982.

Keywords: aircraft noise; reading levels; children; health effects; pollution

Abstract:

The percent of students reading below grade level from 1972 to 1976 was regressed on racial, socioeconomic, educational, and noise level variables for all elementary schools in Brooklyn and Queens, New York. Schools were assigned noise exposure scores based on Noise Exposure Forecast contours for New York City airports. The correlations between these noise scores and a variety of noise level metrics ranged from 0.74 to 0.97. The regression coefficients adjusted for confounding factors indicated that an additional 3.6% of the students in the noisiest schools read at least 1 year below grade level with 95% confidence limits from 1.5 to 5.8%. The dose-response relationship indicated that the percent reading below grade level increased as noise level increased.

Green, Kendall B.; Pasternack, Bernard S.; Shore, Roy E. (1982). "Effects of Aircraft Noise on Hearing Ability of School-Age Children". Archives of Environmental Health, Vol. 37, No. 5, pp. 284-289; September/ October 1982.

Keywords: noise pollution; children; health effects; hearing; aircraft

Abstract:

201 cases with permanent bilateral high-frequency hearing loss and 208 controls with normal hearing were identified through the New York City hearing screening program. Aircraft noise exposure was estimated for the residences of cases and controls from Noise Exposure Forecast contour maps of the New York City airports. The noise exposure estimates had a correlation on 0.89 with noise level measurement made in the area. Birth

certificates and questionnaires were used to provide additional information on other sources of noise exposure and potential confounders. The results showed a positive, but not statistically significant association between aircraft noise exposure and the risk of high-frequency hearing loss.

Guidotti, Tee L.; Goldsmith, John R. (1983). "Air Pollution and Family Health". American Family Physician, Volume 27, number 4, pp. 165-172, April 1983.

Keywords: air pollution; health effects

Abstract:

Air pollution is classified according to chemical characteristics of the pollutants and sources: reducing air pollution, photochemical air pollution, point-source emission and indoor air pollution. The primary pollutants are particulates, oxides of sulphur and nitrogen, ozone, hydrocarbons, carbon monoxide and lead. A knowledge of the effects of these on healthy people and impaired patients can provide the physician with specific measures to apply in individual cases. These effects are described under the headings: respiratory system effects, cardiovascular effects, mucosal irritation, carcinogenesis, neurologic effects.

Guilfoil, Maurice (1984). "untitled letter about methanol copiers". personal correspondence to Bruce M. Small; 1984.

Keywords: methanol copiers; offices; health hazards; indoor air pollution; Michigan

Abstract:

A teacher in Jackson, Michigan has filed a lawsuit over a methanol copier that spewed wood alcohol fumes into his work area. He is highly sensitized to printed materials, and his products lawyer seemed eager to take his case.

Gusella, Joanne L.; Fried, P.A. (1984) "Effects of Maternal Social Drinking and Smoking on Offspring at 13 Months" Neurobehav. Toxicol. Teratol., Vol 6, No. 1, pp. 13-17; 1984.

Keywords: alcohol; pregnancy; smoking; motor skills; mental scale; language

Halford, Ronald W.; McKeown, Edward N. (1981). "School Adequacy Reports #1981:13 and #1981:17, Official Plan Amendment No. 183, East Toronto, South of Eastern Avenue". The Board of Education for the City of Toronto, Notice of Meeting & Agenda, pp. 9-24; October 6, 1981.

Keywords: school locations; air pollution; Toronto; official plan

Abstract:

Reference to amendment to the Official Plan for the City of Toronto Planning Area. Areas designated "Mixed Industrial-Residential" in Official Plan amendment are deemed to be too polluted to house families with school-age children. Includes map showing the areas of heaviest pollution within the City of Toronto and background data for various area industries with major emissions for each.

Halford, Ronald W.; McKeown, Edward N. (1984). "Incident of Air Pollution on January 12, 1984 in the Junction Triangle Area of Toronto". The Board of Education for the City of Toronto, Notice of Meeting and Agenda, pp. 74-78; April 6, 1984.

Keywords: air pollution; Toronto; health effects

Abstract:

Two teachers and several grade 3 students at Perth Avenue Public School in Toronto's Junction Triangle area were subject to severe headaches, dizziness and vomiting after a local skating outing. A Board of Education sub committee was established to report on the incident. It is the view of the report that the resulting absenteeism is not the most significant aspect of this incident. Rather the most serious question is whether there is a possibility of cumulative, harmful after-effects, which subject those school-age children to pain or discomfort during subsequent school attendance or hours of homework. To inflict students and teachers with such conditions is not consistent with excellence in education.

Hall, Ross Hume (1984). "Solving Environmental Problems in the Mainstream". Probe Post, pp. 8-11; Pollution Probe Foundation, 12 Madison Ave., Toronto Ontario M5R 2S1, (416)-926-1647. October 1984.

Keywords: environmental problem-solving; community awareness; policy; overview

Abstract:

This article is an excellent discussion of the kind of approach that may be necessary to solve environmental problems in our communities.

Ross Hall's essential thesis in this article is that environmental considerations must be brought into the mainstream of political decision-making and economic action, and into the mainstream preoccupations of people going about their daily lives. The mainstream involves jobs, public health and safety, educational and economic opportunity, recreational facilities - all everyday life. Translated into terms that are relevant to the Toronto Board of Education study, this article suggests that awareness right through to the classroom level as a part of everyday school life may be critical if pollution and education problems are to be effectively solved.

Halton, David M. (1983). "Occupational Exposures from Spirit-Duplicator Operations". Canadian Centre for Occupational Health & Safety, Hamilton ON L8N 1H6; October 1983.

Keywords: methanol; spirit duplicating machines; air pollution; health hazards

Abstract:

The current technology used in spirit duplicating is discussed. A number of studies have indicated the potential for methanol overexposure from these machines. These are described here, along with the negative health effects. The various exposure-control strategies are reviewed.

Halton, David M. (1983). "Photocopiers - Do They Pose a Health Hazard?". Canadian Centre for Occupational Health & Safety, Hamilton ON; April 1983.

Keywords: photocopiers; indoor air pollution; health hazards

Abstract:

The current technologies used in photocopying machines are briefly described. Concerns that have been raised about health and safety at each step of the copying process are discussed. Particular emphasis has been placed on the chemical components of the technology. Areas of specific concern are : the refilling and disposal techniques for toner in dry machines; levels of isodecane produced by LTT machines; levels of ozone produced; heat and noise levels; and escape of ultraviolet light.

Harding, Douglas H. (1982). "Health Effects of Formaldehyde". Occupational Health in Ontario, Vol. 3, No. 2, pp. 64-80; April 1982.

Keywords: formaldehyde; carcinogen; human exposure; health hazard; sensitivity

Abstract:

The possibly erroneous idea that formaldehyde is a carcinogen is explained in this review. The argument is presented that this substance is an epigenetic carcinogen based on its irritancy and high reactivity. It is the irritancy and not the formaldehyde chemical that induces the chain of events leading to malignancy. The threshold for irritation of formaldehyde is 0.1 ppm, and if such a level were used to control exposure to the chemical, it would be expected that the danger from formaldehyde-induced cancer would be greatly reduced. Possible sources of formaldehyde are listed: cigarette smoke, automotive exhaust, photochemical smog, incinerators, urea formaldehyde in fabrics and building materials. There are individuals who have become hypersensitized to formaldehyde and must avoid it at all costs.

Harrison, John (1983). "Artsmart". Living Safety, No. 4, pp. 26-29; Winter 1983.

Keywords: art supplies; health hazards; craft materials

Abstract:

Art and craft materials can be hazardous to health. Particularly vulnerable are the elderly, children, and people with health problems. Particularly hazardous are ceramics, printmaking, painting and sculpting. The hazards and precautions to take are described in this article.

Hasselblad, Victor; Humble, Charles G.; Graham, Morgan G.; Anderson, Helen S. (1981). "Indoor Environmental Determinants of Lung Function in Children". American Review of Respiratory Disease, Vol. 123, No. 5, pp. 479-485; May 1981.

Keywords: children; questionnaires; age; height; sex; reprints; lung function tests; environmental factors; cigarette smoking; indoor air pollution; air pollution effects - humans

Abstract:

Using pulmonary function and family respiratory questionnaire data for 16,689 white children 6 to 13 years of age from 7 geographic areas, the investigators examined the effect of several environmental and other factors on performance in a standard test of breathing. As expected, FEV 0.75 was correlated most strongly with age, height, and sex. A dose-response relationship was observed with maternal smoking habits and explained 0.1% of the variance. No effect caused by the father's smoking habits was observed. A decrease (p=0.0524) in FEV among older girls was associated with the presence of gas cooking stove in the home. Although statistical significance of the decreases was largely attributable to the size of the sample, the decreases in FEV, even though small, were thought to be biologically significant.

Hathaway, Warren E. (1983). "Lights, Windows, Color: Elements of the School Environment". Alberta Education, 11160 Jasper Ave, Edmonton Alberta T5K 2L0; January 1983.

Keywords: non-visual effects; light; colour; schools; behaviour; health; Alberta; windows

Abstract:

Recent research indicates that there are a great many non-visual effects of light on people. Of these effects, the suntan effect and the control of rickets are two that are well understood. Other important but less well known effects include synchronization of a number of physiological rhythms, and prevention or control of infantile jaundice. Still other research indicates that variations in the quality of light can influence student achievement and behaviour. Closely related to light is colour and there are studies which indicate that colour too can produce measurable effects in the classroom. The reported research is sufficiently conclusive to allow the suggestion that light and colour have predictable effects on students and that learning environments can be designed to foster these predictable effects.

Henzi, H. (1984). "Chronic Methanol Poisoning With The Clinical and Pathologic-Anatomical Features of Multiple Sclerosis". Medical Hypotheses; No. 18, pp. 63-75; 1984.

Keywords: methanol; air pollution; occupational health; multiple sclerosis

Abstract:

The details of two cases of chronic methanol poisoning are presented. Both patients initially developed clinical symptoms of multiple sclerosis: visual disturbances, reduced abdominal reflexes, impaired coordination and difficulties with walking. After the exposure to methanol had ceased, the multiple sclerosis symptoms persisted in one patient but disappeared gradually in patient 2. The results are discussed in connection with the theory that under certain circumstances multiple sclerosis itself is induced by formaldehyde stemming from the metabolism of methanol.

Hijazi, N.; Chai, R.; Bradstreet, J.W.; Duffee, R.A.; Astle, A.; Amster, M. (1983). "Indoor Organic Contaminants in Energy Efficient Buildings". TRC Environmental Consultants, Inc., 800 Connecticut Blvd., East Hartford, CT, USA 06108; 1983.

Keywords: indoor air quality; ventilation; TAGA; testing; chemicals;

Abstract:

A building's ventilation system can meet the accepted ventilation standards, no contaminants are detected near accepted threshold limits, and yet complaints of inadequate indoor air quality continue to be heard. This can be, in part, attributed to the fact that there is currently uncertainty over the amount of ventilation required to maintain an acceptable working environment. In addition, many contaminants can be odorous or irritating at concentrations far below their Threshold Limit Values, and can therefore cause complaints at concentrations which may be too low even to be detected during a conventional sampling program. Chemicals detectable in indoor air include: ammonia, amines, pyridine ("fishy" odour); methyl butyl ketone, butyl acrylate from carpet mastic ("sweet" odour); formaldehyde, acetone, acetic acid from insulation, phenol, methanol, xylene from paint and coatings, nicotine from tobacco smoke, and lactic acid. Xylene is an irritant and central nervous system depressant. Nicotine is also a central nervous system depressant. A new system for testing and measuring air contaminants can help to identify the chemicals present in a given building and trace their sources. TAGA (Trace Atmospheric Gas Analyzer is a mobile analyzer capable of taking samples of gaseous, prepared liquid or solid samples and providing an immediate analysis at concentrations down to the parts per trillion range.

Hoey, John R.; Turcotte, Fernand; Couet, Suzanne; and L'Abbe, Kristan A. (1984). "Health Risks in Homes Insulated with Urea-Formaldehyde Foam". Canadian Medical Association Journal, Vol. 130, No.2, Jan. 15, 1984, pp. 115-117. Reprint requests to Dr. John R. Hoey, Chief, Department of Community Health, Montreal General Hospital, 1597 Pine Ave. W., Montreal, Quebec, Canada H3G 1B3.

Keywords: urea-formaldehyde foam insulation; health effects; tolerance; sensitization;

Abstract: The authors have described a consensus reached by a larger group of researchers meeting in July 1983 near Montreal. This group concludes that although there is no good evidence that systemic symptoms and respiratory illnesses are directly attributable to exposure to UFFI, such attribution is consistent with experience with other toxic gases. True immunologic reactions other than contact dermatitis are unlikely to occur; such reactions in persons exposed to UFFI should prompt a search for other allergens. The possibility of tolerance, sensitivity and idiosyncratic reactions to UFFI should be considered. The risks for cancer and for congenital malformations and other adverse effects on reproduction with exposure to UFFI are probably nonexistent or too low to be detectable.

The authors also note that the results of controlled studies in humans have suggested that tolerance to formaldehyde's odour and adaptation to its irritating effects may develop during prolonged exposure. Tolerance and sensitization to formaldehyde have been clearly shown in mice.

Holland, Walter W. (1974). "Effects of Air Pollution on Children". Pediatrics, Vol. 53, No. 5, Part II, pp. 839-841; May 1974.

Keywords: air pollution; respiratory diseases; health hazards; chronic effects

Abstract:

This article discusses the chronic and acute effects of exposure to high levels of air pollution, specifically impaired respiratory function.

Hollands, John (1984). "Environmental Concerns in Offices and Homes: Conference Report". University of Toronto Staff Association Newsletter, Vol. XIV, No. VI, pp. 7-8; October 1984.

Keywords: indoor air pollution; office environments; allergic responses; VDTs

Abstract:

This is a report on a conference on Environmental Concerns in Offices and Homes, held at the University of Western Ontario's Occupational Health and Safety Resource Centre on September 24 and 25, 1984. Ministry of Labour representatives are reported as suggesting that the sick building syndrome symptoms of headaches, drowsiness, tired eyes and upper respiratory irritation, is caused by inadequate ventilation in modern airtight buildings. VDT user fatigue, eye fatigue and radiation measurement studies were also discussed.

Holma, B.; Kjaer, G.; Stokholm, J. (1979). "Air Pollution, Hygiene and Health of Danish Schoolchildren". The Science of the Total Environment, Vol. 12, pp. 251-286; Elsevier Scientific Publishing Co., Amsterdam; 1979.

Keywords: air pollution; health effects; respiratory health

Abstract:

A comprehensive investigation forming part of a joint European study under the auspices of "WHO Long-Term Air Pollution Programme" uses 7-13 year old school children as the target group. The study has included social, housing, hygienic and epidemic factors as well as family smoking habits. The results indicate that, at exposure to low levels of air pollution, these factors dominate as causes for the impairment of health, especially that of respiratory health.

Hotz, M.C.B. (1985). "Commission on Lead in the Environment". Royal Society of Canada, Commission on Lead in the Environment, 241 Jarvis St., Toronto M5B 2C3; 1985.

Keywords: lead; study; Canada; outdoor air pollution

Abstract:

This sets out the terms of reference for a commission, appointed by the former Minister for the Environment to examine the data from previous studies on lead, assess its validity and relevance to conditions in Canada, and advise the government on any action necessary. A report on lead in gasoline is scheduled for September 1985 and one on other lead is to be completed by September 1986.

Ibsen, Karsten Kaas; Valbjorn, Ole; Nielsen, Aksel (1981). "The Indoor Environment and Symptoms of Disease. Assessment of the Conditions in Schools in Copenhagen". Ugeskrift For Laeger, No. 143, pp. 1919-1923; July 1981.

Keywords: indoor air quality; schools; allergy; renovations; carpeting

Abstract:

A comparison was made between the incidence of disease and symptoms and the design of schools, with particular attention to the age of the buildings, flooring and ventilation systems. The registration of conditions of health in 14,561 pupils in 88 schools made by the school health services and a questionnaire involving 1226 pupils in 14 schools in Copenhagen were used. Significantly more numerous cases of allergy (asthma and hay-fever) were found in schools with textiles as floor coverings and significantly more numerous cases of skin conditions in the schools which were less than five years old or which had been renovated within the past five years. 31% of the pupils and 40% of the teaching staff stated that they took headache medicine at least once per month. Under one third of these pupils and over half of these teachers took headache medicine at least once weekly. By comparison between data obtained in the indoor environmental investigation and the registrations made by school health services, it was found that pupils stated higher incidences than those registered by the health services people. More than one third of the pupils participating in the indoor environment investigation had complaints which they attributed to the indoor environment. The majority had complaints concerning heat and noise. In schools with textile floor coverings, static electricity was the most widespread inconvenience as 60% complained about this as compared with 5% in the remaining schools.

Imbus, Harold R. (1982). "Acute Effects of Exposure to Formaldehyde". May, 1982.

Keywords: formaldehyde; air pollution; indoor air pollution; health hazards; chemical sensitization; susceptibility

Abstract:

Formaldehyde can result whenever there is combustion, and is emitted from auto exhaust, fuel burning, photoxidation reactions, cigarette smoking. Formaldehyde is also contained in consumer products such as fabrics and paper products as well as a wide range of building materials. It is an irritant and a sensitizer, the latter meaning that it is capable of producing allergic sensitization - a specific immune response in an individual who becomes allergic to a substance. A number of organs can be affected by formaldehyde, primarily the skin, eye, upper and lower respiratory tracts, and the gastrointestinal system.

Ingraham, Leon (1983). "Electromagnetic Radiation and Student Off-Task Behavior". Alberta Education, Planning Services Branch; July 1983.

Keywords: electromagnetic radiation; children; fluorescent lights; Alberta

Abstract:

The effects of electromagnetic radiation emitted from fluorescent lights on the off-task behaviours of grade three school pupils was studied. The independent variable was the level of electromagnetic radiation which was eliminated by grounding and shielding the fluorescent light fixtures in the experimental classroom. The off-task behaviours were recorded by a reliable on-sight observer for two groups of pupils. For the intact classroom group (comprised of all pupils and heterogenous with respect to hyperactivity) the elimination of electromagnetic radiation decreased significantly the rate of off-task behaviours. For triad groups (groups of three pupils selected as being most "hyperactive) the results were mixed and inconclusive. Contrary to expectations, pupils from this latter group who were prone to hyperactivity, demonstrated no benefit from the elimination of electromagnetic radiation. Further studies are suggested.

Jacko, M.G.; Ducharme, R.T. (1973). "Brake Emissions: Emission Measurements from Brake & Clutch Linings From Selected Mobile Sources." Environmental Protection Agency, Office of Air and Water Programs, Ann Arbor MI 48105; March 1973.

Keywords: air pollution; automobile; brakes; clutches; emission; particles; asbestos

Abstract:

In order to define the extent of gas and particulate emissions from automotive brakes and clutches, a combination separation and storage collection system was devised. Unique emissions collectors for both disc and drum brakes and for a clutch were designed and built as the main embodiment of this instrumentation. The hardware was installed on a vehicle which was then driven through various test cycles to determine extent and type of brake emissions generated at low and high operating temperatures. The particulates were processed and analyzed by a combination of optical and electron miscroscopy to ascertain the asbestos content and the particle size distribution. On the average, more than 99.7 percent of the asbestos is converted; the contribution to the atmosphere is 5060 pounds, or 3.2 percent of the total asbestos emissions.

Jaeger, R.J. (1981). "Carbon Monoxide in Houses and Vehicles". Bull. N.Y. Acad. Med., Vol. 57, No. 10, pp. 860-872; December 1981.

Keywords: smoking; gas stove; growth; learning; indoor air pollution; fetal pathology; carbon monoxide; CO

Abstract:

Carbon monoxide is a common indoor air pollutant whose major toxic action from a public health standpoint appears to be associated with very subtle changes in neonatal growth, learning, and activity when low to moderate concentrations are tested. Such concentrations might occur after cigarette smoking or from living in poorly ventilated homes that use gas stoves for heating. Utilization of unvented internal combustion engines indoors should be discouraged, as should smoking. Carbon monoxide levels in blood range from less than 1% in nonsmokers to 5 to 10% in smokers. In fetuses of smoking mothers, as much as 7.6% of CO-HB was reported.

James, Walter A. (1983). "Computerized Chemical Inventory Program: Toronto Board of Education". The Board of Education for the City of Toronto, 155 College St., Toronto Canada M5T 1P6; March 3, 1983.

Keywords: chemical effects; education; Toronto

Abstract:

A report was made by the Toronto Board of Education's Director of Education to the Board's Business Administration Committee concerning a proposed Computerized Chemical Inventory Program. It was proposed that the following measures would form an effective program: 1) Compile master listing of chemicals in use in schools; 2) Review the hazard rating of these chemicals; 3) Supply each Chemistry, Physics and Biology Department head with reference materials for chemicals; 4) Expand "Hazardline" (a private computer data base) access to technical school's chemistry offices. A total cost for these suggestions was placed at $16,500.

Johnson, Kirk A.; Batts Young, Bambi (1982). "Environmental Agents and Behavioral Aberration: A Neglected Public Health Dilemma". Center For Science in the Public Interest, 1982.

Keywords: environmental toxins; behaviour; nervous system; public policy

Abstract:

This paper gives a brief review of some of the pesticides, heavy metals, pollutants, foods, food additives, and drugs that have been linked with unexpected behavioural disturbances, including paranoia, hyperactivity, anxiety, and hallucinations. Unfortunately, high rates of misdiagnosis indicate that many health professionals are unaware that behavioural aberrations in a patient might be caused by exposure to such environmental factors. Many health professionals tend to attribute patients' complaints to mental illness, stress, or other non-physical agents. The authors find a clear need for more controlled, double-blind studies of behavioural toxins. Federal regulatory agencies could provide a major impetus for such research by requiring that new and existing chemicals be tested for behavioural effects, and by considering behavioural effects when setting health and safety standards.

Junction Triangle Environmental Liaison Committee (1984). "Minutes of a Meeting Wednesday, November 28, 1984 at Perth Avenue School". Ministry of the Environment, Ontario, Barney Singh, Committee Chairman.

Keywords: nitrogen dioxide; nitric oxide; Junction Triangle; carbon monoxide; total hydrocarbons; sulphur dioxide; downtown Toronto; soiling index; TAGA Survey; health study;

Abstract:

The Minutes of this November 28, 1984 meeting of the Junction Triangle Liaison Committee include a review of technical information on a 1984 survey downwind of the Glidden Plant, and discussion of the Toronto Board of Health primary and followup studies of the health of residents of the area. An environmental audit of industries in the area was also described.

Kagawa, J.; Tsuru, K.; Doi, T.; Tsunoda, T.; Toyama, T.; Nakaza, M. (1980). "Lung Function Studies on Intermittently Exercising High School Students Exposed to Air Pollution". from Nitrogen Oxides and Their Effects on Health; pp. 333-342; Lee, S.D., editor; Ann Arbor Science Publishers Inc.; 1980.

Keywords: air pollution; exercise; nitrogen dioxide; sulphur dioxide; suspended particulate matter; ozone; oxidant; health effects

Abstract:

The acute effects of air pollution on the lung function of 9 high school students with two hours intermittent exercise were investigated during 2 consecutive 5-day periods. Multiple regression analysis was performed for each subject, utilizing each lung function test as the dependent variable and each environmental factor as the independent variable. The evaluation of the square of the multiple correlation coefficient suggests that significant contributions of the environmental factors to the total variance of lung function were seen in about half the subjects.

Kagawa, Jun; Toyama, Toshio (1975). "Photochemical Air Pollution". Archives of Environmental Health, Vol. 30, pp. 117-122; March 1975.

Keywords: air pollution; health effects; children

Abstract:

The effects of photochemical air pollution on respiratory function of Tokyo elementary school children were investigated. Nine types of environmental factors were continuously recorded. Seven categories of respiratory function tests were performed on 20 normal 11-year old children once a week from June to December 1972, as a general rule. The correlation coefficients between respiratory function measurements and each of the environmental factors were calculated. The maximum expiratory flow rate (V max) showed high correlation with the largest number of environmental factors. Among environmental factors, temperature highly affected various respiratory function tests. The ozone was significantly associated with airway resistance (Raw) or specific airway conductance (Gaw/Vtg), NO or NO2 with V max, and temperature with Raw, Gaw/Vtg, and V max. Two subjects among all subjects were considered as the reactors to the environmental factors.

Kahler, Kathryn (1984). "Federal Ban on Asbestos Zeros in on 3 Products". Jackson Citizen Patriot, p. A-14; October 18, 1984.

Keywords: asbestos; government regulation; USA

Abstract:

Four products that contain asbestos are likely to be banned by the US government by the end of 1984 and the use of remaining asbestos products is expected to be phased out over the next 10 years. The ban on four product categories includes cement pipe and fittings, roofing felts, flooring felts and floor tile. The phaseout will cover other products such as brake linings and clutch plates, gaskets and the undercoating of cars. The Environmental Protection Agency is studying a recent request from the Natural Resources Defense Council, an environmental law group, to ban asbestos in brake linings.

Kalnins, R.; and Gaudert, P.C. (1985). "Formaldehyde Emissions from Typical Particleboard Applications and Assessment of Specific Abatement Measures". Sodexen, Inc. and National Research Council of Canada, Ottawa. Presented at the International Specialty Conference on Indoor Air Quality in Cold Climates: Hazards and Abatement Measures; Ottawa, Ontario, April 29, 30 and May 1, 1985. (Conference Sponsored by Air Pollution Control Association TT-7 Indoor Air Quality Committee, Health and Welfare Canada, National Research Council of Canada, Public Works Canada, Consumer and Corporate Affairs Canada, and Canada Mortgage and Housing Corporation).

Keywords: formaldehyde; emissions; particleboard; abatement; urea formaldehyde;

Abstract:

Formaldehyde emissions from building materials made with formaldehyde-based resin binders have caused much concern to health authorities, government regulatory agencies, and affected homeowners. In particular, certain urea formaldehyde (UF) resin-bonded particleboards tend to have high emission potential because of the inherent hydrolytical instability of such resins. In modern home construction such board is used extensively in the built-in furniture and shelving in the kitchen, bathrooms, and closets. In some cases UF-bonded particleboard is also applied in the floor construction. Additional amounts of such board are introduced into the finished dwellings by furniture. A preliminary investigation in a senior citizens' apartment indicated that installed particleboard was the major cause of the unacceptable formaldehyde levels. Concentrations in the air ranged from 0.2 to 0.8 ppm in the upper floor apartments, built with particleboard floor underlay. The present recommended limit is 0.1 ppm.

Kasuga, Hitoshi; Hasebe, Akihisa; Osaka, Fumio; Matsuki, Hideaki (1979). "Respiratory Symptoms in School Children and the Role of Passive Smoking". Tokai J. Exp. Clin. Med., Vol. 4, No. 2, pp. 101-114; 1979.

Keywords: respiratory health; health effects; smoking; carbon monoxide; asthma; passive smoking; air pollution

Abstract:

A study of respiratory symptoms in 1,937 school children aged 6-11 years was carried out in Suginami, Tokyo and the response rate was 99.5%. The prevalence rate for symptoms was associated with their families' smoking habits and their residential conditions; the prevalence rate was the highest among heavy-smoker families living in the area along a main highway (within 50 meters), and the lowest in non-smoker families regardless of their residential areas. Furthermore, if they lived in an area well away from a main highway (over 100 meters), the prevalence rate was also the lowest regardless of the families' smoking habits. Relative risk in the highest group was 4.0. Previous studies have already suggested that there was a relationship between symptoms and passive smoking while some have insisted that there was no relationship between them. This study may be useful in solving such contradictory problems and in establishing the role of passive smoking in respiratory symptoms.

Kato, Terutaka; Kasuya, Minoru; Kagamimori, Sadanobu; Kozuka, Hiroshi; Hashimoto, Takejiro; Kawano, Shoichi (1981). "Evaluation of Aerial Environmental Pollution by Means of Indicator Plants in a Slightly Polluted Area - Relationship Between the Vigor of Japanese Cedars and Prevalence of Respiratory Symptoms in School Children". Journal of Pharmacobio-dynamics, Vol. 4, No. 5, p. S-60; 1981.

Keywords: air pollution; health effects; vegetation; respiratory symptoms children

Abstract:

The effects of low grade air pollution on human health and vegetation were studied in a Japanese rural area by three approaches: a field survey for estimating the degree of injury to Japanese Cedars; a biochemical study to clarify the mechanisms of inhibition of tannin biosynthesis in the Cedars; an epidemiological study of respiratory symptoms in children.

Kerrebijn, K.F.; Mourmans, A.R.M.; Biersteker, K. (1975). "Study on the Relationship of Air Pollution to Respiratory Disease in Schoolchildren". Environmental Research, No. 10, pp. 14-28; 1975.

Keywords: air pollution; respiratory disease; school children

Abstract:

Respiratory symptoms and ventilatory functions were measured in fourth and fifth grade school children living in two areas that differ in air pollution but are comparable with respect to social and demographic factors. Children living in the high-pollution area showed a higher prevalence of cough during the day or at night, which is assumed to be due to the difference in pollution level. Mean ventilatory function in the children from both areas did not differ. In both areas mean PEFR (peak expiratory flow rate) and mean FEV (forced expiratory volume) of children with symptoms were lower than in children without. Depending on the criteria used, prevalence figures for chronic respiratory disease ranged between 5.3-12.7% in the high-pollution and 3.3-9.8% in the low polluted area.

Kershner, John R.; Morton, L.L. (1984). "Negative Air Ionization Improves Memory and Attention in Learning-Disabled and Mentally Retarded Children". Journal of Abnormal Child Psychology, Vol. 12, No. 2, pp. 353-366; 1984.

Keywords: negative air ions; learning disabilities; memory

Abstract:

The effect of increased concentrations of ambient negative air ions on incidental visual memory for words and purposive auditory memory was investigated in 20 normal grade 4 children, 8 learning-disabled children, and 8 mildly mentally retarded children. All of the children breathing negatively ionized air were superior in incidental memory. The action of negative ions on the neurotransmitter, serotonin, may be the mechanism by which negative ions produce such behavioural effects.

Kershner, John; Stansfield, Michael; Kershner, Barbara; Hadfield, Audrey (1985). "Air Quality in the Classroom Affects Memory in Four Learning Impaired Children". Ontario Institute for Studies in Education; 1985.

Keywords: special education; negative air ions; learning disabilities

Abstract:

The air in a special education classroom was modified alternatively over a three month period so that every two weeks the children were breathing air with a high ambient concentration of negative air ions. Under double-blind conditions, the four learning impaired children in this class were assessed on measures of immediate memory, letter naming, text copying, math, spelling and a parent-teacher questionnaire. When breathing negatively ionized air, in comparison to a placebo-air condition consisting of regular classroom air, all of the children, irrespective of their unique psychoeducational characteristics, demonstrated a moderate improvement in short-term visual and auditory memory. One child showed a large improvement in classroom behaviour.

King, E. (1982). "Lead Poisoning". Public Health Review, Vol. 10, No. 1, pp. 49-76; Technosdar Ltd. - International Scientific Publications; 1982.

Keywords: lead poisoning; occupational; air pollution; clinical and sub-clinical effects; health effects

Abstract:

Despite the enormous research effort, as evidenced by the number of publications in recent years, there is still no clear understanding of the mechanism of lead poisoning or consensus of opinion as to the importance, or even existence in some cases, of the effects of lead below the levels of clinical lead poisoning. This article discusses how we have arrived at our present impasse in both the occupational and communal fields.

Kittler, Fred J.; Baldwin, D.G. (1970). "The Role of Allergic Factors in the Child with Minimal Brain Dysfunction". Annals of Allergy, Vol. 28, pp. 203-206; May, 1970.

Keywords: minimal brain dysfunction syndrome; allergy-tension-fatigue syndrome; learning disabilities

Abstract:

Formal elementary education finds many children with learning disabilities and behaviour problems. Many manifest some combination of the signs and symptoms of the minimal brain dysfunction syndrome. Allergy of the tension-fatigue syndrome general classification is present in a significant percentage of children with minimal brain dysfunction syndrome and the authors believe allergy causes them to have this syndrome.

Kruss, P.; Valeriote, L.M. (1979) "Asbestos". from Controversial Chemicals, A Citizen's Guide; pp. 17-30; Multiscience Publications Ltd., Montreal PQ; 1979.

Keywords: asbestos

Abstract:

Asbestos has long been known as a threat to health. It causes asbestosis - severe scarring of the lungs caused by continually inhaling asbestos over the course of many years. The symptoms begin with shortness of breath, which develops into near paralysis that makes breathing and body movement increasingly difficult, leading to ultimate suffocation. It is now accepted that asbestos is also an agent for cancer of the abdomen, liver, gastro-intestinal tract and lung. The risk of lung cancer appears to be synergistic with smoking. It is widely used for filters in the chemical, food and beverage industries, resulting in asbestos fibres in most beers, wines and liquors, soft drinks, sugar and lard. It is also found in our drinking water.

Kruss, P.; Valeriote, L.M. (1979). "Fluoride". Multiscience Publications Limited, Montreal Canada; pp. 92-98; 1979.

Keywords: fluoride; drinking water; air pollution; fluorine

Abstract:

Industrial processes release fluoride into the environment, damaging plants and animals. There is a controversy over the fluoridation of drinking water and its effect on health. The chronic effect of long term exposure to fluoride has been blamed for an increased incidence of mongolism, a variety of symptoms such as headache, nausea and loss of weight, bone abnormalities such as osteosclerosis, and kidney and thyroid injury.

Kruus, P.; Valeriote, I.M. (1979). "Controversial Chemicals - a Citizen's Guide". Multiscience Publications Limited, 1253 McGill College, Suite 175, Montreal Canada H3B 2Y5; 1979.

Keywords: alcohol; arsenic; asbestos; benzene; cadmium; caffeine; chloroform; DBCP; DDT; Dioxin; Fenitrothion; fluoride; fluorocarbons; kepone and mirex; lead; mercury; nitrites and nitrates; nitrogen oxides; PCBs; phosphates; saccharin; sulphur dioxide; tobacco; tris; vinyl chloride

Abstract:

25 chemicals are listed in alphabetical order, a chapter devoted to each. Historical, technological, medical, economic and political backgrounds of these controversial chemicals are reported.

Kruus, P.; Valeriote, I.M. (1979). "Lead". Multiscience Publications Limited, Montreal Canada; pp. 128-136; 1979.

Keywords: lead; gasoline additives; air pollution; water pollution; automobile emissions; regulation

Abstract:

Lead is used in gasoline additives, and is therefore an ever-present pollutant in urban areas. Leaded gasoline is the largest single source of gaseous atmospheric contamination. The Toronto Refiners and Smelters and Canada Metal Co. cases are cited. Health effects in humans and effects on wildlife and vegetation are discussed. Lead affects three systems in people: the nervous system, the kidney, and red blood synthesis. Government regulation in Canada is described.

Kruus, P.; Valeriote, I.M. (1979). "Sulphur Dioxide". Multiscience Publications Limited, Montreal Canada; pp. 190-195; 1979.

Keywords: sulphur dioxide; acid rain; air pollution; respiratory health

Abstract:

Acidic precipitation is increasing due to the growing introduction of sulphur dioxide into the atmosphere. It has been linked with detrimental effects on fish, vegetation, buildings and people. Human health problems are related to irritation of the respiratory system.

Lachtman, Dennis S. (1980). "Human Data Associated with Diesel Exhaust". from Health Effects of Diesel Engine Emissions, Vol. 2; pp. 1100-1113; Pepelko, W.E.; Donner, R.M.; Clarke, N.A., editors; November 1980.

Keywords: diesel exhaust; health effects; human; mortality and morbidity

Abstract:

A review of the literature concerning data relative to human exposures from diesel engines is presented. Epidemiologic evaluations among workers exposed to diesel exhaust are discussed. Morbidity and mortality data are critically reviewed. The outline of a mortality and morbidity study to be completed in 1981 among construction workers exposed to diesel exhaust is given.

Laseter, John L.; DeLeon, Ildefonso R.; Rea, William J.; Butler, Joel R. (1983). "Chlorinated Hydrocarbon Pesticides in Environmentally Sensitive Patients". Clinical Ecology, Vol. II, No. 1, pp. 3-12; Fall 1983.

Keywords: pesticides; environmental sensitivity; mass spectrometry; gas chromatography

Abstract:

The sensitive and selective analytical techniques of high-resolution gas chromatography and high-resolution gas chromatography-mass spectrometry were employed to characterize 16 different synthetic chlorinated hydrocarbon pesticides and common metabolites present in randomly selected environmentally sensitive patients. Of 200 patients initially screened, 99% had residues at or above the .05 ppb level in their sera.

Lassiter, Donald V.; Milby, Thomas H. (1978). "Health Effects of Diesel Exhaust Emissions: A Comprehensive Literature Review, Evaluation and Research Gaps Analysis". Environmental Health Associates, Inc., 2150 Shattuck Ave., Berkeley CA 94704; January, 1978.

Keywords: diesel exhaust emissions; air pollution; health effects; polycyclic aromatic hydrocarbons

Abstract:

The purpose of the report was to provide a comprehensive literature review of the human health consequences of exposure to diesel exhaust emissions, especially as encountered in underground mines, and to define those gaps in current scientific knowledge which require further clarification through additional research. The toxicology of diesel exhaust both as a mixture and as individual toxicants was examined. In a properly ventilated mine, neither CO, SO2, nor NO2 were found to be major toxic problems. Polycyclic aromatic hydrocarbon (PAH) compounds were identified as the most potentially hazardous agents found in diesel engine exhaust. Although a properly maintained diesel engine would be likely to emit extremely small amounts of these agents, the possibility that they might be carcinogenic to humans singles them out for careful attention.

Laties, Victor G.; Beard, Rodney R.; Dinman, Bertram D.; Schulte, John H. (1969). "Behavioral Aspects of Carbon Monoxide Poisoning". from Effects of Chronic Exposure to Low Levels of Carbon Monoxide on Human Health, Behavior, and Performance; pp. 32-37; US National Research Council, Washington DC; 1969.

Keywords: air pollution; carbon monoxide; environment; pollution; toxicity; behaviour; learning disabilities

Abstract:

It is apparent that there has been very little modern work on CO and behaviour. Most investigators have noted symptoms of CO poisoning first when the level of CO in the blood was raised to between 10% and 20% but many symptoms don't appear until the concentration of CO in the blood increases beyond 25%. However, Schulte has shown positive correlations between CO concentrations in the blood and performance decrement in a number of tests. For example, his subjects were required to do 50 arithmetic problems, each involving five five-digit numbers. They took about 13 minutes to complete the task under control conditions but about 17 minutes when their COHb level was 20% and made more errors under the latter conditions.

Laurie, R. Dana; Boyes, William K.; Wessendarp, Thomas (1980). "Behavioral Alterations Due to Diesel Exhaust Exposure". from Health Effects of Diesel Engine Emissions; pp. 698-712; Pepelko, W. E., Danner, R.M., Clarke, N.A., editors; US Environmental Protection Agency; November 1980.

Keywords: diesel exhaust; behaviour; health effects; air pollution; animal testing

Abstract:

Several experiments examining the effects of diesel exhaust on the behavior of rats are reported. Animals were exposed either as adults or neonates. The spontaneous locomotor activity (SLA), measured in standard running wheel cages, of adult rats exposed for 8 hours per day, 7 days per week was significantly less than that of controls. Experiments involving diesel exhaust exposure to neonatal rats indicated that adult rats, exposed to diesel exhaust during their neonatal lives, were significantly less active as measured by SLA. Adult rats, exposed to 20 hours of diesel per day as neonates, were placed in skinner boxes after the SLA experiment described above had been completed. The exhaust exposed animals showed significantly decreased performance of a food-reinforced bar-pressing task. All animals that learned this task extinguished at the same rate. The results of the neonatal diesel exhaust experiments support the hypotheses that diesel exhaust exposure during development of an organism can lead to behavioural differences in adulthood.

Lebowitz, M.D. (1983). "Health Effects of Indoor Pollutants". Annual Review of Public Health, Vol. 4, pp. 203-221; 1983.

Keywords: indoor air pollution; formaldehyde; freon; passive smoking; combustion products; health concerns

Abstract:

Sources, concentrations, health risks and public health concerns associated with indoor pollutants are analyzed. Both outdoor and indoor sources of pollutants are responsible for indoor pollutant concentrations. The pollutants that are predominantly outdoors include sulphur oxides, ozone and related oxidants, most trace metals, halogen compounds, petrochemical compounds, pesticides, ultra-violet radiation, and pollen. Indoor-based pollutants include carbon monoxide, respirable particles, organic vapours, nitrogen dioxide, formaldehyde, radon, asbestos, mineral and synthetic fibers, carbon dioxide and viable organisms.

Lebowitz, Michael D.; Armet, David B.; Knudson, Ronald (1982). "The Effect of Passive Smoking on Pulmonary Function in Children". Environment International, Vol. 8, No. 1/6; 1982; Pergamon Press, Oxford, Toronto; 1982.

Keywords: air pollution - environmental impact; tobacco smoke; health care; indoor air pollution; health effects; children

Abstract:

It is apparent that household aggregation of pulmonary function, which is dependent on household aggregation of body mass, might affect the relationship of children's pulmonary function to parental smoking. When these household aggregations were corrected for, there was no relationship of children's pulmonary function values to parental smoking.

Letz, Richard; Ware, James H.; Ferris, Benjamin G.; Spengler, John D. (1982). "Pulmonary Functions of Children and Indoor NO2 Concentrations." Environment International, Vol. 8, No. 1/6; 1982; Pergamon Press, Oxford, Toronto; 1982.

Keywords: children; pulmonary functions; nitrogen dioxide; gas stoves

Abstract:

A study of NO2 concentrations inside 137 homes in Portage, Wisconsin was made. An attempt was made to directly relate the observed lung functions of the children living in these homes to the observed NO2 concentrations. This was not found to be possible in this study. Several explanations are put forward: 1) NO2 may not be the offending agent. Gas stoves emit carbon monoxide, carbon dioxide, sulphur dioxide, nitrogen dioxide, formaldehyde, hydrogen cyanide, water vapour, carbon, and sulfate particles. 2) Perhaps only a sensitive sub-population is affected by the offending agent, and they may not have been well represented by this group. 3) Peak levels of NO2 may cause these health effects and long-term averages are poorly related to those peaks in this study. 4) Perhaps such a relationship exists and can only be detected by a much larger sample size.

Lucas, D.; Rao, A.V.; Hartwell, T. (1982). "Asbestos-containing Materials in School Buildings: Guidance for Asbestos Analytical Programs. Statistical Background Document". US Govt Reports Announcements & Index, Issue 21; 1982.

Keywords: sampling procedures; laboratory quality assurance measures; bulk samples; statistical support; asbestos; schools; indoor air

Maclennan, John G. (1985). "The Impact of Indoor Air Pollution on the Behaviour and Learning Ability of School Children". Presented at the International Speciality Conference on Indoor Air Quality in Cold Climates: Hazards and Abatement Measures; Ottawa, Ontario, April 29, 30 and May 1, 1985. (Conference Sponsored by Air Pollution Control Association TT-7 Indoor Air Quality Committee, Health and Welfare Canada, National Research Council of Canada, Public Works Canada, Consumer and Corporate Affairs Canada, and Canada Mortgage and Housing Corporation.)

Keywords: hypersensitivity; children; ecological illness; particulate inhalants; chemical fumes; central nervous system; learning ability

Abstract:

The author states that increasing numbers of the Canadian population are inheriting the ability to acquire hypersensitivities to different environmental exposures. The commonest indoor contaminants found in school are particulate inhalants and chemical fumes, odours and smokes. There are also hazards for the food sensitive person, but these can usually be managed by ecological control of lunches and supervision by school personnel. Important chemical exposures are derived from tobacco smoke, perfume, fossil fuels and their derivatives, plant terpenes, photocopiers, duplicators, cleaning and maintenance materials, craft and other office and school supplies. In the majority of cases, the brain and central nervous system are the major areas of hypersensitive reaction which is reflected in the child's behaviours and ability to learn.

MacLeod, Kathryn E. (1979). "Sources of Emissions of Polychlorinated Biphenyls into the Ambient Atmosphere and Indoor Air". US Govt.; March 1979.

Keywords: air pollution; sources; chlorine organic compounds; transformers; industrial wastes; sites; chemical analysis; electric substations; ballasts (electric); fluorescent lamps; monitoring; gas analysis; polychlorinated biphenyls; indoor air pollution; air pollution sampling; air pollution detection

MacLeod, Kathryn E. (1981). "Polychlorinated Biphenyls in Indoor Air". Environmental Science and Technology, Vol. 15, No. 8, pp. 926-928; May 1981.

Keywords: PCB indoor air pollution; fluorescent light ballast sampling technique; gas analysis; polyurethane resins; contamination; residue levels identifiers

Abstract:

PCBs have been recognized as environmental contaminants since the mid-60s. Until recently, however, little work has been done on identifying levels of PCBs in the indoor air. This paper describes a method for the analysis of PCBs utilizing low-volume indoor air sampling. The method uses polyurethane foam as a collector. This study shows that indoor air whether in commercial, industrial, or residential buildings, contains levels of PCBs at least 1 order of magnitude higher than outdoor levels. Defective fluorescent light ballasts are also shown to emit PCBs and to be an important source of indoor atmospheric contamination.

Mactutus, Charles F.; Tilson, Hugh A. (1984) "Neonatal Chlordecone Exposure Impairs Early Learning and Retention of Active Avoidance in the Rat" Neurobehav. Toxicol. Teratol., Vol. 6, No. 1, pp. 75-83; 1984.

Keywords: chlordecone; neurotoxicity; early learning

Abstract:

Exposure to chlordecone, a chlorinated hydrocarbon pesticide, produces a toxicological profile in adult humans characterized by neurologic signs and symptoms of tremor, irritability/hyper-responsiveness, weight loss and memory impairment.

Mahaffey, Kathryn R.; Vanderveen, John E. (1979). "Nutrient-Toxicant Interactions: Susceptible Populations". Environmental Health Perspectives, Vol. 29, pp. 81-87; 1979.

Keywords: chemical susceptibility; pollution; environmental; nutrition

Abstract:

Nutritional status can substantially modify the toxicity of environmental pollutants. Investigations with experimental animals and epidemiological observations on humans have established the role of nutrition in altering susceptibility to a variety of pollutants including pesticides and heavy metals. The degree of nutritional deficiency that alters susceptibility need not be severe. Frequently only biochemical indications of nutritional deficiency can be associated with changes in the dose-response of an animal or person to a toxic compound.

Main, David M.; Hogan, Theodore J. (1983) "Health Effects of Low-Level Exposure to Formaldehyde". Journal of Occupational Medicine, Vol. 25, No. 12, pp. 896-900; December 1983.

Keywords: formaldehyde; health effects

Abstract:

Twenty-one subjects exposed to formaldehyde at levels between 0.12 and 1.6 ppm were examined by questionnaire and spirometry. Symptoms of eye and throat irritation and increased headache and fatigue, irritation of the nose, chest tightness, and shortness of breath were common.

Makower, Joel (1981). "Office Hazards". Tilden Press, 1737 DeSales St., NW, Washington DC 20036; 1981. (esp. Ch. 1, 'There's Something in the Air')

Keywords: indoor air pollution; noise pollution; stress; health hazards; occupational health; offices

Abstract:

Energy efficiency and design deficiencies have helped to make air pollution in offices a bigger health problem than air pollution outdoors. Substances such as ammonia, asbestos, benzene, cadmium, carbon monoxide, ethanol, fiberglass, formaldehyde, methanol, nitropyrenes, ozone, PCBs, particulates, radon, tobacco smoke, toluene, trichlorethane, trichloroethylene, trinitrofluorenone and vinyl chloride are all present in the typical office environment and all are possibly hazardous. Some are potential or proven carcinogens, while a number, such as trichloroethylene, carbon dioxide, carbon monoxide and benzene have been implicated in central nervous system damage, dizziness, and other symptoms that could cause learning problems. Fluorescent light, video display terminals and other sources of radiation join stress as being some of the main offenders.

Mandell, Marshall (1976). "Factors Contributing to a State of Increased Susceptibility". from Clinical Ecology; Dickey, Lawrence D., editor; chapter 65, pp. 570-576; Charles C. Thomas; 1976.

Keywords: chemical susceptibility; vitamin deficiency; immune system; pollution; activators

Abstract:

It is the author's current belief that already known, or yet to be discovered, genetically determined metabolic defects, enzymatic dysfunctions, antigen-stimulated immunologic mechanisms, hormonal imbalances, and various kinds of nutritional deficiencies have profound effects on cellular processes which are activated or impaired by exogenous offenders.

Mandell, Marshall; Waller Scanlon, Lynne (1979). "Physical and Mental Allergies in Children". from Dr. Mandell's 5-Day Allergy Relief System, chapter 5, pp. 133-187; Thomas Y. Crowell Publishers; 1979.

Keywords: Feingold Diet; hyperactivity; food allergies; pollution; additives; learning disabilities; asthma; indoor air pollution; health hazards; children; allergic pseudo-retardation

Abstract:

Many types of poor behaviour in schools, from hyperactivity, irritability, violence, fatigue, restlessness, to poor academic performance, can be caused by food and chemical allergies. In many cases, the nervous system is totally incapable of functioning normally because it is under allergic distress. The child who reads well once in a while and poorly at other times; the child whose writing is poor one day and fine the next; the child who can sit still in the morning, but is impossible to control in the afternoon - each of these children may be demonstrating cerebral allergy. Many case studies are provided from the author's practice.

Marks, James G., Jr.; Trautlein, Joseph J.; Zwillich, Clifford W.; Demers, Laurence M. (1984). "Contact Urticaria and Airway Obstruction From Carbonless Copy Paper". Journal of the American Medical Association, pp. 1038-1040; August 1984.

Keywords: health effects; carbonless copy paper; office

Abstract:

A 27-year-old woman experienced pruritus, eye and throat irritation, hoarseness, shortness of breath, and fatigue within half an hour of exposure to carbonless copy paper. On two separate occasions, she was purposely challenged in a controlled-blinded fashion with portions of the carbonless copy paper. This resulted on both occasions in contact urticaria of the hand that held the paper and changes in pulmonary function flow-volume loops characteristic of upper airway obstruction. It was concluded that the cutaneous and respiratory symptoms induced by the carbonless copy paper were probably related to prostaglandin release.

Marks, James G. (1981). "Allergic Contact Dermatitis from Carbonless Copy Paper". Journal of the American Medical Assoc., Vol. 245, No. 22, pp. 2331-2332; June 12, 1981.

Keywords: carbonless copy paper; dermatitis; health hazards; chemicals; paratoluene sulfinate

Abstract:

Allergic contact dermatitis from carbonless copy paper is documented. The offending agent proved to a coating on the paper - a colour-forming chemical composed of paratoluene sulfinate of Michler's hydrol (PTSMH). It apparently has a low sensitizing capacity.

Markus, Harold; Portaro, Joseph (1984) "The Immune Status of Patients in a General Orthomolecular Medical Practice". Journal of Orthomolecular Psychiatry, Vol. 13, No. 2, pp. 123-129; 1984.

Keywords: AIDS; allergy

McGee, Charles T. (1979). "Crimes of Violence". How To Survive Modern Technology, Part 111, Chapter 3, pp. 191-197; Keats Publishing, Inc., 1979.

Keywords: biochemical effects; crime; hyperactivity

Abstract:

Many factors interact to create a criminal or delinquent. Strictly behavioural approaches don't seem to be doing the job of controlling or preventing the problem. The fact that environmental factors such as ordinary foods, food additives, inhalants, environmental chemicals and heavy-metal poisoning can affect behaviour is documented. A logical step would be to evaluate every person with violent anti-social behaviour using metabolic studies and environmental sensitivity testing.

McGee, Charles T. (1979). "Health, Light, and the Electromagnetic Spectrum". How To Survive Modern Technology, chapter 5, pp. 108-116; Keats Publishing, Inc., 1979.

Keywords: fluorescent lights; hyperactivity; health effects; electromagnetic radiation; children

Abstract:

Studies by researchers such as John Ott show that electromagnetic radiation can have negative effects on both plant life and people. Human muscle strength is weakened under exposure to light that lacks part of the natural spectrum. Classroom experiments indicate that student performance, behaviour and hyperactivity improve when regular fluorescent lights are replaced with full spectrum fluorescent lights. Microwaves and X-rays have also been discovered to be health hazards.

McLaughlin, Don E.; Kagen, Herbert P. (1974). "The Effects of Sulphur Dioxide on Learning and Activity in the Rat". Proceedings of the West Virginia Academy of Science-CISTI, Vol. 45, No. 4 pp. 439-444; 1974.

Keywords: SO2; air pollution; weight; learning; behavioural aspects; health effects

Abstract:

The investigation was an attempt to ascertain the behavioural effects of chronic exposure to sulphur dioxide, a major atmospheric pollutant. The behaviours of interest were learning in simple and complex learning tasks and activity. In addition, a progress record of each subject's weight was kept. The subjects consisted of forty-three male rats which were assigned to one of two control conditions or one of four experimental conditions. The results indicate that sulphur dioxide alone had no effect on performance. There was, however, a significant trials effect and the interaction between SO2 and the number of trials in the maze also proved to be significant. Activity was found to be increased as the

SO2 concentrations increased. Finally, it was found that the rats living in the higher concentrations tended to be heavier than those in the lower concentrations.

Medical World News (1982). "Lung-cancer Increase Linked to Breathing Diesel -engine Fumes". Medical World News, pp. 22-24; April 26 1982.

Keywords: health effects; diesel exhaust; cancer

Abstract:

Heavy exposure to exhausts from diesel engines may raise Americans' lung cancer risk by as much as 40%, according to Dr. Marc B. Schenker of Harvard University. A review was made of health records of 2,519 railroad workers. Men with the highest exposure to diesel fumes had a lung cancer rate nearly 40% higher than unexposed workers.

Melia, R.J.W.; Florey, C. du V.; Chinn, S.; Goldstein, B.D.; Brooks, A.G. F.; John, H.H.; Clark, John D.; Craighead, I.B.; Webster, X. (1980). "The Relation Between Indoor Air Pollution from Nitrogen Dioxide and Respiratory Illness in Primary Schoolchildren". Bulletin Europeen de Physiopathologie Respiratoire; Vol. 16, No. 1, pp. 7-8; 1980.

Keywords: gas cooking; indoor air pollution; respiratory health; nitrogen dioxide; children

Abstract:

In the UK an association between respiratory illness in primary schoolchildren and the use of gas for cooking has been found in two separate national samples. These findings appeared to be independent of interfering factors such as age, social class and smoking in the home. The association has been found in one large study in the USA, but not in three other studies in the same country. The authors suggest that nitrogen dioxide arising in the emissions of gas combustion might be the cause of the association.

Menzies, K.T.; Beltis, K.J.; Levins, P.L.; Sadowski, L.H.; Workman, B.A. (1980). "In-Mine Measurement of Reactive Diesel Exhaust Contaminants". US Govt.; Sept. 3 1980.

Keywords: mines - excavation; exhaust emissions; air pollution control; laboratory equipment; concentration (composition); comparison; calibrating; field tests; particles; sampling; carbon monoxide; carbon dioxide; nitrogen dioxide; sulphur dioxide; aldehydes; aromatic polycyclic hydrocarbons; nitrogen oxide (NO); formaldehyde; acroleins; formic acid; inorganic sulfates; diesel engine exhaust; indoor air pollution; catalytic reactors (exhaust systems); path of pollutants; water conditioners

Meyer, Beat (1983). "Indoor Air Quality". Department of Chemistry, University of Washington, Seattle, WA, USA. Addison-Wesley Publishing Company, Inc., Reading, MA, USA and Don Mills, Ontario, Canada, 1983; ISBN 0-201-05094-3.

Keywords: indoor air pollution; air quality management; comfort; monitoring; analysis;

Abstract:

This author describes some of the factors that determine indoor air quality and reviews the status of knowledge in the field. He supplies a complete bibliography on indoor air quality problems and measurement techniques.

Millar, I.B.; Cooney, P.A. (1982). "Urban Lead - A Study of Environmental Lead and its Significance to School Children in the Vicinity of a Major Trunk Road." Atmospheric Environment, Vol. 16, No. 3, pp. 615-620; Pergamon Press Ltd. 1982.

Keywords: lead; school children; automobile exhaust; health effects; air pollution

Abstract:

Measurements of children's blood lead levels were ascertained in relation to lead in air and lead in dust attributed to an Inner London arterial highway carrying about 35,000 vehicles per day. The contribution of lead from deteriorating paintwork was also examined. The authors suggest that the findings indicate that lead from vehicles is not contributing measurably to the blood lead levels of children living or being educated in the area.

Miller, Claudia S. (1979). "Mass Psychogenic Illness or Chemically-Induced Hypersusceptibility?". U.S. Dept. of Health, Education, and Welfare, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health; 1979.

Keywords: susceptibility; sensitivity; industrial; health; chemical pollution

Abstract:

There are literally millions of workers who are wondering why they never seem to feel well, why they are irritable when they get home, sleepy all day long, and exhausted when they get up in the morning. They are not hypochondriacs or hysterics. Most are simply susceptible to chemicals with which they are working, or to which they are exposed. It has been shown that so-called subjective symptoms of mass hysteria are identical in every respect to symptoms experienced by persons tested for susceptibility to various petrochemicals. It can be objectively demonstrated by testing affected individuals with suspected chemical incitants.

Mineralab Inc. (1979). "A Clinician's Guide to Toxic Metals". Mineralab Inc., 3106 Diablo Ave, Hayward CA 94545; 1979.

Keywords: chemicals; occupational exposures; symptoms; mercury

Abstract:

Sources, occupational exposures, signs and symptoms of toxic metal exposures are described in an easy-to-reference guide format.

Mineva, T.; Miteva, B.; Skopakova, K.; Stefanova, S.; Lazarova, R. (1981). "Somatic Morbidity Rate of Students From a Secondary Poly Technical School for Nonferrous Metallurgy". Khigiena I Zdraveopazvane, Vol. 24, No. 1, pp. 77-83; 1981.

Keywords: schools; occupational training; health hazards; nonferrous metallurgy; air pollution

Abstract:

The effect of occupational training on the health state of 273 students from a secondary polytechnical school for nonferrous metallurgy was studied as well as that of control groups from the school and a region with unpolluted air. The student metal workers train in an environment with predominantly chemical noxae. All students from SPTS are subjected to an additional chemical effect from the local air. The highest acute and chronic morbidity was found among the student metal workers, with diseases of the respiratory system predominating. As well there were functional disorders and caries. Data on lead effects were also established in the upper courses: hypochromic anemia, lead-stained spots on gingiva, etc. The control group had the lowest somatic morbidity, with no data for toxic effect.

Ministry of Education 1980. "Asbestos in Public Buildings". Ministry of Education, Occupational Health & Safety Division; March 1980.

Keywords: asbestos; occupational health and safety; health effects

Abstract:

This is a manual prepared for the inspection of school facilities.

Ministry of the Environment (1984a). "MAMU No. 3 (TAGA) Survey: Junction Triangle; Technical Memorandum Dated November 19, 1984 from G.B. DeBrou to Dr. E. Singer, Air Resources Branch, Ministry of the Environment, Ontario". Ministry of the Environment, Air Resources Branch, 135 St. Clair Ave. West, Suite 100, Toronto, Ontario M4V 1P5.

Keywords: analysis; outdoor pollution; Junction Triangle; Glidden; acetone; methyl ethyl ketone; ethanediol; environmental monitoring

Abstract: Measurements were taken with a TAGA Trace Atmospheric Gas Analyzer on a day with somewhat variable wind speed and direction. Few substantial odours were present that day. Estimated concentrations are listed based on 20 instantaneous readings averaged over a 5 minute period. The results illustrated the array of volatile organic chemicals at relatively low concentrations. The major contaminants at that time were identified as acetone, methyl ethyl ketone and ethanediol. (See p. 74 of this report for the list of findings).

Ministry of the Environment (1984b). "Preliminary Hearing Document on Proposals for the Regulation of Mobile PCB Destruction Facilities in Ontario". Ontario Ministry of the Environment; September 1984.

Keywords: PCBs; mobile incineration; destruction; hearings

Abstract:

This document presents the background to the PCB situation in Ontario, the proposals for the regulation of mobile PCB destruction facilities, a description of the public consultation program, an analysis of concerns and recommendations received.

Moch-Sibony, A. (1981). "The Effects of Prolonged Exposure to Noise on Certain Psychomotor, Intellectual and Personality Aspects of Children - Comparison Between A Soundproof and a Nonsoundproof School". Travail Humain, Vol. 44, No. 1, pp. 169-178; 1981.

Keywords: noise pollution; aircraft noise; health effects; children; soundproofing;

Abstract:

The effects were studied of prolonged exposure to noise on certain psychomotor, intellectual and personality aspects of children. The authors present the results obtained in a field study undertaken in a zone highly exposed to aviation noise. A comparison made between a sound-proofed and a non sound-proofed school brought out the following facts: the children do not express any feeling of disturbances as to the frequency of airplane passage; yet, after prolonged exposure to the auditory stimulus, perturbations of certain intellectual, psychomotor and personality aspects are observed. The authors estimate that the numerous airplane passages are at the origin of attentional troubles which would explain to a large extent the negative effects observed.

Mueller, William (1985). "Who Says Pesticides Aren't Dangerous?". Better Nutrition, pp. 26-27, 42; January 1985.

Keywords: genetic mutation; birth defects; pesticides; health hazards

Abstract:

The author claims that pesticides can under some circumstances cause death or affect people with flu-like symptoms, blurred vision, mental depression, confusion, lethargy, and nasal problems.

Nagda, Niren L.; Rector, Harry E. (1983). "Guidelines for Monitoring Indoor Air Quality". Geomet Technologies, Inc., Rockville MD; Environmental Protection Agency, Office of Research and Development, Washington DC USA. Contract EPA-68-02-3679; Report EPA-600/4-83-046; NTIS PB83-264465. With 8-page Project Summary.

Keywords: air pollution; guidelines; monitors; mathematical control; design criteria; quality assurance; quality control; measuring instruments; substitutes; performance evaluation; asbestos; aerosols; carbon monoxide; organic compounds; formaldehyde; particles; nitrogen dioxide; ozone; radon; sulfphur dioxide; indoor air pollution; air quality; air pollution detection; mass balance;

Abstract: This document provides guidelines for designing programs to measure indoor air quality. Brief summaries of past and current research and descriptions of indoor contaminants provide a background for developing the monitoring design. Factors that influence air quality are discussed with the aid of mass balance models. An extensive review of measurement systems, including a listing of numerous instruments with their performance specifications, is presented.

Nagira, T.; Hisashige, A.; Kume, Y.; Ueno, M.; Yamamoto, M.; Aoyama, H.; Kurumatani, N. (1981). "Health Hazards Among Children in Air Polluted Districts, Report 2: Exposure to Automobile Exhaust and Prevalence of Subjective Symptoms Among School Children". Nippon Eiseigaku Zasshi, Vol. 36, No. 3, pp. 596-612; 1981.

Keywords: air pollution; automobile exhaust; carbon monoxide; health effects; nitrogen dioxide;

Abstract:

Recent rapid motorization in Japan has posed the serious problem of air pollution caused by automobile exhaust. Route 43 has the highest congestions of vehicular traffic in Japan and runs through dense residential areas. Children in schools located along this highway have been found to have increasing rates of respiratory disorders. NO2 concentrations near Route 43 have exceeded the short-term exposure limit (0.10–0.17 ppm) proposed as the guideline for the protection of public health by WHO Task Group, which also recommended that this limit be stricter for sensitive subjects such as children. In 1979, the authors polled children concerning respiratory, rhinopharyngeal and eye disorders in two elementary schools facing the highway and one school in a non-polluted area, using a self-administered questionnaire. Results were as follows: children attending the two polluted schools had higher rates of disorders relating to bronchial asthma, recurrent respiratory infection and allergies; a close relationship was found between the prevalence of such conditions and distance from the highway and this gradient corresponded to the level of nitrogen oxides; air conditioners furnished at schools appeared to have some remedying effect on these disorders; children who lived south of the highway had higher rates of disease due to higher concentration of exhaust carried at night by northerly winds.

Needleman, Herbert L. (1983). "Lead at Low Doses and the Behaviour of Children". NeuroToxicology, Vol. 4, No. 3, pp. 121-133; 1983.

Keywords: lead; neurotoxicity; children; behaviour

Abstract:

Lead can be a useful paradigm with which to deepen our understanding of the health significance of hazardous substances in general, and to clarify the necessary steps and barriers to their removal from the human environment. Epidemiologic data demonstrate a clear effect of lead at low doses. When taken with animal studies which show disturbed learning at low dose in the rodent and non-human primate, altered development of synapses in the developing rodent brain and delayed appearance of brain cytochromes in the immature rodent, the case seems strong that lead at low doses is an important and widely distributed neurotoxin.

Needleman, Herbert L.; Gunnoe, Charles; Leviton, Alan; Reed, Robert; Peresie, Henry; Maher, Cornelius; Barrett, Peter (1979). "Deficits in Psychologic and Classroom Performance of Children With Elevated Dentine Lead Levels". The New England Journal of Medicine, Vol. 300, No. 13, pp. 689-695; Mass. Medical Society; March 29, 1979.

Keywords: air pollution; lead; neuropsychologic effects; children

Abstract:

To measure the neuropsychologic effects of unidentified childhood exposure to lead, the performance of 58 children with high and 100 low dentine lead levels was compared. Children with high lead levels scored significantly less well on the Wechsler Intelligence Scale for Children than those with low lead levels. This difference was also apparent on verbal subtests, on three other measures of auditory or speech processing and on a measure of attention. Analysis of variance showed that none of these differences could be explained by any of the 39 other variables studied. Also evaluated by a teachers' questionnaire was the classroom behaviour of all 2146 children whose teeth were analyzed. The frequency of non-adaptive classroom behaviour increased in a dose-related fashion to dentine lead level. Lead exposure, at doses below those producing symptoms severe enough to be diagnosed clinically, appears to be associated with neuropsychologic deficits that may interfere with classroom performance.

Nethercott, James R. (1982). "Health Effects of Formaldehyde". University of Toronto, St. Michael's Hospital, Dept. of Occupational and Environmental Health. Corpus, Formaldehyde: The Facts Conference, Toronto Canada, May 3-4 1982.

Keywords: formaldehyde; health effects

Abstract:

This paper describes the health effects of formaldehyde. These include irritation to the skin, eye, lung and mucosal surfaces; sensitization; alteration in irritancy threshold; mutagenicity; carcinogenicity. Although some of these effects have not yet been proven in humans, the author feels that it is prudent to regard formaldehyde as a possible cause because of animal data. Detailed studies of persons who believe they are being intoxicated by low level formaldehyde exposure is necessary.

Nielsen, Ove (1984). "Quality of Air and the Amount of Fresh Air in Classrooms". Indoor Air, Vol. 5, pp. 221-226; Swedish Council for Building Research, Stockholm Sweden, 1984.

Keywords: indoor air quality; ventilation; schools; evaluation; Denmark

Abstract:

The results of a study of the indoor climate at 11 Danish schools are described. The investigation shows how the pupils themselves experience the indoor climate and indicates, for example, the relationship between the volume of outdoor air supplied per pupil and the pupils' evaluation of the quality of the air in the classroom.

Nussbaum, Karen (1981). "Warning: Health Hazards for Office Workers". Working Women Education Fund, 1224 Huron Rd., Cleveland OH 44115; April, 1981.

Keywords: office products; health hazards; indoor air pollution

Abstract:

There are many hazards present in a modern office building. These include those resulting from improper ventilation and "tight building syndrome", hazardous office products such as liquid eraser products (which contain trichloroethylene and tetrachloroethylene, known carcinogens) and cleaning solvents (containing benzene, a carcinogen and toluene, a powerful narcotic), ozone from photocopiers, formaldehyde, and passive cigarette smoke.

O'Banion, Dan R. (1981). "An Ecological and Nutritional Approach to Behavioral Medicine". Charles C Thomas, Springfield IL; 1981.

Keywords: susceptibility; ecological illness; pollution; school environments; nutritional approach

Abstract:

This book presents a history and analysis of research and descriptive evidence indicating that food, chemical and inhalant substances play a major role in determining human health. A full range of psychological and physical health disorders, including learning disabilities and childhood hyperactivity are related to susceptibility and reactions to ecological and nutritional events. Extensive case studies are included.

O'Banion, Dan R. (1981). "Skill Development and Maintenance". from The Ecological and Nutritional Treatment of Health Disorders, pp. 168-179; Charles C. Thomas, Springfield IL; 1981.

Keywords: academic development; chemical sensitivity; food sensitivity

Abstract:

Many people who are food and chemically sensitive have trouble developing and then maintaining appropriate social and academic skills. When a person is stressed physiologically, learning problems and skill deficits result and typically are treated solely from a psychological standpoint.

Behaviours which are related to sensitivities and which affect learning are increased activation, an increased probability of frustration, decreased attention span, perceptual problems, and memory deficits. Most frequently chemically and food sensitive children experience problems in spelling, reading comprehension and auditory memory skills. Deficiencies in these areas may be indicative of malfunctioning neurological systems that predispose the individual to having difficulty learning certain types of tasks. Specific physiological systems may be malfunctioning, causing specific learning deficiencies. If an individual does have skill and learning deficiencies in specific areas due to an inability to attend to stimuli presented in a certain mode, special techniques and testing methods can be used. An improvement in the student's environment, removing the offending substances, will be the best long-term solution.

O'Banion, Dan R. (1981). "The Chemical Problem". from An Ecological and Nutritional Approach to Behavioral Medicine, pp. 69 -164; Charles C. Thomas, Springfield IL; 1981.

Keywords: indoor air pollution; chemical sensitivity; schools; learning difficulties

Abstract:

One of the most important settings that influences a child's life is the school environment. This environment should be kept relatively uncontaminated especially for chemically sensitive children whose learning may be greatly affected by reactions to chemicals; however, even less chemically sensitive individuals who appear not to have any dramatic problem learning may be affected by such exposures. Slight fatigue, sleepiness, and uncooperativeness are often produced by chemical exposure and easily corrected by cleaning up the chemical environment in the school setting. Yet, the school environment is one of the most chemically contaminated environments in our society. A wide variety of indoor air pollutant sources in schools is described, including the use of pesticides, motor exhaust, chemicals in clothing, and lighting. How these affect learning and behaviour in children is documented.

O'Banion, Dan R. (1981). "The Ecological and Nutritional Treatment of Health Disorders". Charles C Thomas, Springfield IL; 1981.

Keywords: chemical sensitivity; pollution; health effects; physiological effects; behavioural effects; chemicals

Abstract:

This book ties together the physiological and behavioural effects, both direct and indirect, of increased sensitivity to various ecological agents including common foods and chemicals used prevalently in our society. Individual susceptibility to specific food, chemical, and inhalant substances may contribute to a wide range of psychological and physical health problems, including learning disabilities. The effects of food and chemical sensitivities, stages of adaptation, levels of reaction, diagnosis and ecological treatment are all discussed.

O'Banion, Dan R.; Peek, Leon A.; Butler, Joel R. (1981). "Behaviors Characteristic of Learning Disabilities Related to Specific Foods in an Adolescent". from An Ecological and Nutritional Approach to Behavioral Medicine, pp. 147-164; Charles C. Thomas Publisher, Springfield IL; 1981.

Keywords: learning disabilities; behaviour; food allergies; sensitivities

Abstract:

A fifteen year old male adolescent with an extensive history of behaviour and learning disorders had undergone traditional psychological, educational, and medical treatments to no avail. A food testing program involving the ingestion of single foods of organic or less chemically contaminated sources was established to ascertain relationships between specific foods and the individual's physical, educational, and behavioural irregularities. It was found that extreme aggression and hyperactivity each occurred within minutes after the ingestion of a specific food. The food related to the hyperactive state was tested a second time under more closely observed conditions with a resulting decrease in performance on a symbol-digit coding task and the occurrence of a number reversal on one of the coding forms when the reaction was in progress.

O'Brien, John (1984). "Toxic, Deadly - and Widely Used". USA Today, p. 12A; December 1984.

Keywords: methyl isocyanate; air pollution

Abstract:

A quantity of methyl isocyanate, the same chemical that recently spilled in Bhopal India, killing 2,000 people, spilled near an elementary school in New York state. The elementary school, 500 yards from the spill, was evacuated and children and teachers suffered irritated eyes and minor breathing problems.

O'Shea, James A.; Porter, Seymour F. (1981). "Double-Blind Study of Children With Hyperkinetic Syndrome Treated with Multi-Allergen Extract Sublingually". Journal of Learning Disabilities, Vol. 14, No. 4; April 1981.

Keywords: hyperactivity; foods; additives; inhalant allergens; treatment; immunotherapy; children

Abstract:

Children were tested, over a six-week period, by double-blind studies, to determine whether the hyperkinetic syndrome is due, in part, to certain foods, food colours, and inhalant allergens. Behaviour was monitored by parents, teachers, and a psychologist. Significant improvement was reported in 11 of 14 participants.

Olsen, Jorgen H.; Dossing, Martin (1982). "Formaldehyde Induced Symptoms in Day Care Centers". Am. Ind. Hyg. Assoc. Journal, Vol. 23, pp. 366-370; May 1982.

Keywords: particleboard; formaldehyde; indoor air pollution; health hazards

Abstract:

A questionnaire study was performed among 70 employees at seven mobile day care centers where urea-formaldehyde-glued particleboard has been used for indoor panelling and among 34 employees at three control institutions selected at random where no particle board has been used as building materials. Responses showed a significantly higher frequency of the following symptoms among the staff at the mobile institutions: mucous membrane irritation, headache, abnormal tiredness, menstrual irregularities and use of analgetics. The median concentration of formaldehyde in the mobile institutions was 0.43 mg/m 3 in contrast to a concentration in the control institutions of about 0.08 mg/m 3.

Ontario Association for Children With Learning Disabilities. "Range of Aluminum in Hair". Ontario Association for Children With Learning Disabilities, Toronto, Canada.

Keywords: aluminum; survey; geographic; Association for Children With Learning Disabilities

Abstract:

The results of surveys, both published and those done by the Oshawa Association for Children with Learning Disabilities, are presented. Although standard ranges of aluminum in hair have not been established, 9.9 ppm was chosen because levels of aluminum in hair generally are reduced below 9.9 ppm following treatment. From survey results, large percentages of people in the Oshawa and Toronto areas had over this level. 100% of those children who were learning disabled in the Oshawa area had levels over 9.2 ppm.

Ontario Federation of Labour (1982). "Occupational Health and Safety: A Training Manual". Copp Clark Pitman, Toronto Canada; 1982.

Keywords: health effects; occupational health; toxic substances; physical injury; air pollution; hazardous substances; cancer; noise; equipment; material handling; stress; ventilation; protective equipment; legislation; unions;

Abstract:

This manual offers a comprehensive information base, enabling workers to understand their working environment. It covers a wide range of toxic substances and pollution sources, detailing how they affect health. Also covered are stress, material handling, making machinery and equipment safe, principles of ventilation, personal protective equipment, and legislation in Ontario.

Ontario Govt. (1980). "Ontario Regulation 191/84 Under the Occupational Health and Safety Act". Revised Statutes of Ontario, Chapter 321; Govt. of Ontario, 1980.

Keywords: teachers; joint health and safety committee

Abstract:

A regulation that makes the Act apply to teachers in a manner that is consistent with The Education Act and refers to the establishment of joint health and safety committees for teachers.

Ontario Govt.(1980). "Regulation Respecting Mercury Made Under the Occupational Health and Safety Act". Revised Statutes of Ontario, Chapter 321; Govt. of Ontario; 1980.

Keywords: mercury; government regulation

Abstract:

This regulation provides codes for: respiratory equipment; determination of mercury in blood and urine; measuring airborne mercury; medical surveillance for mercury.

Ontario Govt. (1980). "Regulation Respecting Vinyl Chloride - Made Under the Occupational Health and Safety Act". Revised Statutes of Ontario, Chapter 321; Govt. of Ontario, 1980.

Keywords: vinyl chloride; government regulation

Abstract:

A regulation governing the respiratory equipment to be used, describing the prescribed method for measuring airborne vinyl chloride, and providing a code for medical surveillance for the substance in the workplace.

Opalko, K.; Lisiecka, K.; Mitrega, J.; Mietkiewska, B. (1982). "Fluoride in Air, Saliva, Urine, and Enamel in School Children". Fluoride, Vol. 15, No. 2, pp. 78-81; April 1982.

Keywords: fluoride; air pollution; health effects

Abstract:

The aim of this study was to reveal the fluoride level in saliva, urine, and enamel in 123 school children, aged 7 and 10 years, of both sexes. The children under study resided in Police where the concentration of fluoride in air was several times above the allowable limit. The level of fluoride in saliva was significantly higher in the exposed area than in the control. The fluoride content of the enamel and the urine was similar in both groups. A higher value of DMFS index was observed in children aged 7 and 10 living in the area exposed to fluoride.

Ostapovich, L.K. (1975). "Conditions of Respiratory Route Exposure to Sulphur Dioxide and Formaldehyde and Subsequent Sensitization". Gigiena I Sanitariia, No. 2, pp. 9-13; 1975.

Keywords: sulphur dioxide; formaldehyde; sensitization; allergic reactions; respiratory

Abstract:

The effects of concentration and conditions of exposure on the development of toxic and allergic reactions to sulphur dioxide and formaldehyde were investigated. It was concluded that sulphur dioxide has toxic effects which are manifested as an alteration in the chronaxy ratio of antagonistic muscles, as an increase in whole blood cholinesterase activity, and as changes in blood hemoglobin concentration and erythrocyte counts. Exposure to formaldehyde in concentrations of 7 or 2 mg/m 3 leads to sensitization. The possibility of an early onset of allergy in response to low doses of the agents in question points to the need for conducting specific tests indicative of allergy (as highly sensitive indicators of adverse effects) in establishing hygienic norms for air pollution.

Ott, John N. (1973). "Health And Light". Pocket Books/Simon & Schuster, 1973.

Keywords: light; full spectrum; fluorescent; hyperkinesis; schools

Abstract:

In 1973 a study was conducted by the Environmental Health and Light Research Institute in Sarasota Florida, showing dramatic reactions in hyperactive children. In two first-grade classrooms, the standard cool white fluorescent tubes and fixtures with solid plastic diffusers remained unchanged. The plastic diffusers stopped the transmission of any trace of long-wavelength ultraviolet. In two other classrooms, the tubes were replaced with full-spectrum fluorescent tubes that more closely duplicated natural daylight. By means of hidden time-lapse cameras, student behaviour was observed and recorded. Under the standard cool white lighting, some children demonstrated nervous fatigue, irritability, lapses of attention, and hyperactive behaviour. Within a week of the new lights being installed, a marked improvement in their behaviour appeared and overall classroom performance improved. Experiments are also referred to in which the effect of light and darkness on the pineal gland has been studied, as well as studies concerning low-frequency non-ionizing radiation, hyperactivity and learning disabilities. A connection is also suggested between the hyperactive reaction to radiation from unshielded fluorescent tubes and the same symptoms triggered by artificial food flavours and colourings.

Ott, John R.; Mayron, Lewis W. (1976). "Influence of Fluorescent Lights on Hyperactivity and Learning Disabilities". Environmental Health and Light Research Institute, Sarasota, Florida. Journal of Learning Disabilities, Vol. 9, No. 7 (Aug/Sep 1976), pp. 417-422.

Keywords: fluorescent lights; electromagnetic effects; shielding; full-spectrum ultraviolet light;

Abstract:

This study describes in detail the study of the Environmental Health and Light Institute, in which four regular elementary windowless classrooms, two with standard type fluorescent cool-white tubes and two with full spectrum, radiation-shielded fluorescent fixtures, were compared for their effects on hyperactive behaviour. Time-lapse photography was used to produce a permanent record of the children's actions. The study concluded that cool-white unshielded fluorescent lights could contribute to hyperactive behaviour.

Ott, John N. (1982). "Light, Radiation and You". Devin-Adair Company, Old Greenwich, Connecticut, USA, 1982.

Keywords: fluorescent lights; video display terminals; ultraviolet; full spectrum; behaviour; hyperactivity; irritability;

Abstract:

This popular format book describes Dr. Ott's experiments with the effects of various electromagnetic exposures, including light, on muscle strength and other body measurements.

Ott, W.; Flachsbart, P. (1982). "Measurement of Carbon Monoxide Concentrations in Indoor and Outdoor Locations Using Personal Exposure Monitors". Environ. Int., Vol. 8, No. 1/6, pp. 295-304; 1982.

Keywords: carbon monoxide; indoor air pollution

Abstract:

On 15 dates, 5000 measurements of carbon monoxide were made in downtown commercial settings in 4 California cities, using personal exposure monitoring (PEM) instruments. The data indicate that most commercial settings experience CO concentrations above zero indoors, because CO tends to seep into buildings from vehicular emissions outside. Levels in these locations usually are not above 5 ppm and seldom are higher than the U.S. health-related ambient air quality standards for CO. However, indoor garages and buildings with attached indoor parking areas are exceptions and can experience relatively high CO concentrations.

Pappert, Ann (1984). "Worker Beware". Homemaker's Magazine, April 1984, pp. 12-28; Comac Communications Ltd., Toronto Canada; 1984.

Keywords: indoor air pollution; ventilation; office buildings; health hazards

Abstract:

The World Health Organization has declared indoor air to be increasingly damaging to health, as well-insulated, energy-efficient buildings combine with inadequate ventilation systems to circulate a wide variety of toxic substances. Examples are detailed of instances of Office Workers Syndrome, and situations where office workers have attempted to have the air quality studied and improved are detailed.

Pengelly, L. David; Kerigan, Antony T.; Goldsmith, Charles H.; Inman, Elizabeth E. (1983). "The Hamilton Study: Distribution of Factors Confounding the Relationship Between Air Quality and Respiratory Health". Air Pollution Control Association; June 1983.

Keywords: indoor air pollution; outdoor air pollution; respiratory; health effects; school children; long-term exposure; low levels; passive smoking; Hamilton, Ontario

Abstract:

To clarify the role of ambient air quality among the many factors which contribute to chronic lung disease, the respiratory health of a cohort of elementary school children in Hamilton, Ontario was studied. A specific issue in this study was that of the distribution of the co-variables of: tobacco smoking in the home, the use of gas for cooking, respiratory symptoms in other family members, respiratory disease in infancy, crowding in the home, income and social/occupational status as well as the distribution of air quality. The study found that the prevalence or magnitude of these co-variables was not uniformly distributed among the diverse areas of the city studied, nor were the characteristics of air quality which were measured. In addition, the patterns of prevalence which were found among the areas tended to occur in the same direction, such that the effects of the co-variables tended to reinforce each other. For instance, the children studied in the industrial core had the highest percentage of prevalence of all the co-variables.

Pengelly, L.D.; Goldsmith, C.H.; Kerigan, A.T.; Toplack, S.A.; Furlong, W.J. (1982). "The Hamilton Study: Relationships Between Indoor and Outdoor Levels of Sulphur Dioxide, Nitrogen Dioxide and Particulates in Elementary Schools". Air Pollution Control Association, Pittsburgh PA; 1982.

Keywords: indoor air pollution; outdoor; schools; S0 2; N0 2; particulate; sulphur dioxide; nitrogen dioxide

Abstract:

Some preliminary analyses of indoor and outdoor air pollution levels in 12 Hamilton, Ontario schools was carried out. Analysis of the results of SO2, NO2 and particulate measurement was carried out to determine the influence of school age and outdoor concentration on the measured indoor level. The design and construction of a building has an influence on the indoor level of NO2 over a range of outdoor NO2 levels. We can speculate that the principal factor which influences this relationship is the infiltration or ventilation rate. Newer schools tend to have positive ventilation systems which draw in "fresh air" from the outside; old schools did not have methods for providing for ventilation aside from opening windows.

Pepelko, W.E.; Danner, R.M.; Clarke, N.A. (1980). "Health Effects of Diesel Engine Emissions: Proceedings of an International Symposium, Volume 11". US Environmental Protection Agency, November 1980.

Keywords: diesel engine exhaust; physical characteristics; chemical characteristics; air pollution; carcinogen; metabolic effects; health hazards; mutagenicity; biochemical effects

Abstract:

The purpose of the symposium was to bring together scientists and engineers from the public and private sectors to discuss their research findings on the health effects of diesel engine emissions and to conclude with a discussion of health risk assessment of diesel exhaust. The Proceedings are organized into eight main sections corresponding to the format of the symposium and addressing physical and chemical characteristics, in vitro carcinogenic and mutagenic effects, biochemical and metabolic effects, toxicological effects of inhaled emissions, mutagenic and carcinogenic potency of extracts of diesel and related environmental emissions, mutagenicity of inhaled diesel emissions, carcinogenic effects of exposure to diesel emissions, epidemiological studies, and lastly a panel discussion on health risk assessment of diesel emissions.

Petit, Ted L.; Alfano, Dennis P.; LeBoutillier, Janelle C. (1983). "Early Lead Exposure and the Hippocampus: A Review and Recent Advances". NeuroToxicology, Vol.4, No. 1, pp. 79-94; 1983.

Keywords: lead; lead exposure; neurological disturbances; behaviour; children

Abstract:

This report summarizes recent experiments conducted both in the authors' laboratory and in others', examining the effects of early lead exposure on the development of a specific portion of the human brain - the hippocampus, and behaviours characteristic of hippocampal dysfunction. Following postnatal lead exposure, marked reductions are seen in general hippocampal development. Observations support the suggestion that the hippocampus may play a critical role in mediating many of the behavioural changes observed following early lead exposure. However, as other brain areas are also clearly affected by lead, alternative explanations for these lead induced behavioural changes are also discussed.

Pfeifer, J.; Richter,J.; Keveova, E.; Kral, V. (1983).
"Alterations of Selected Indicators of Local Immunity in Children Having Been Exposed to the Action of Formaldehyde of a Long Duration". Cs. Pediat., Vol. 38, No. 5, pp. 274-277; 1983.

Keywords: local immunity; formaldehyde; wood-chip panels; fibreboard

Abstract:

A group of schoolchildren who had undergone long-term exposure to formaldehyde as well as an non-exposed control group were studied. This long-term study (3 years) looked at 159 children. Decreased values of salivary SIgA and of lysozym were repeatedly observed in exposed children and after elimination of the exposure, a prompt normalization of the findings was seen. A statistically significant higher occurrence of abnormal findings in the studied immunity indicators could also be demonstrated. On the basis of data, the authors consider buildings built of prefabricated woodchip board made with the use of a formaldehyde glue to be unfit for the long-term use of children.

Pfeiffer, Carl C. (1975). "Lead, Mercury and Cadmium". from Mental and Elemental Nutrients, chapter 32, pp. 311-324; Keats Publishing Inc.; 1975.

Keywords: lead; mercury; cadmium; hyperactivity; air pollution; health hazards; learning disabilities; toxicity; heavy metals

Abstract:

A number of studies have found a correlation between hyperactivity, mental retardation and learning disabilities and heavy metal ingestion from air pollution. A major source of lead pollution is from auto exhaust, but antiquated lead pipes polluting drinking water, cigarettes, lead-contaminated food supplies and lead-based paints are also sources of lead. Pesticides and fish are the most notorious sources of mercury, but mercury pollution also originates from coal burning, mercury vapour lamps, etc.

Pfeiffer, Carl C. (1979). "The Schizophrenias - At Least Three Types: Cerebral Allergy". from Mental and Elemental Nutrients, chapter 40, pp. 415-417; Keats Publishing; 1979.

Keywords: cerebral allergy; allergy; allergy-tension-fatigue syndrome; learning disability; pollution

Abstract:

Allergic children can have an allergy-tension-fatigue syndrome which results in disinterest in learning and thus decreases learning ability. Such symptoms as specific learning disabilities, perceptual-motor deficits, coordination deficits, hyperkinesis, emotional lability, short attention span, and abnormal electroencaphalograms have been cured or eased by diagnosis and the offending allergen's being removed.

Philpott, William H.; Kalita, Dwight K. (1980). "Human Ecology and Mental Health". from Brain Allergies: The Psycho-Nutrient Connection, chapter 3, pp. 15-27; Keats Publishing, Inc., 1980.

Keywords: ecological illness; chemical sensitivity; pollution; health; behavioural responses; learning; memory; environmental maladaption

Abstract:

An individual's ability to handle toxins, pollens, foods and chemicals contracted from the environment differs considerably according to his or her unique chemical makeup. The more defective his or her ability, by inheritance, enzyme deficiency, malnutrition, harbored infection or otherwise, the more likely a person is to develop maladaptive symptoms on exposure to food and environmental contacts. A group of 250 emotionally disturbed patients developed major symptoms on exposure to their commonly consumed foods and frequently encountered chemicals. Symptoms included psychosis, schizophrenia, blurred vision, anxiety, dissociation, delusions, headaches, dizziness, inability to read or write, hyperactivity, and a whole range of gastro-intestinal problems.

Philpott, William H.; Philpott, Katherine; Khaleeluddin, Khaja (1981). "The Roles of Bio-Ecologic Diagnosis and Treatment of Organic Factors in Mental Disorders". The Institute for Bio-Ecologic Medicine; January, 1981.

Keywords: chemicals; food allergies; chemical susceptibility; mental function; organic brain disorders

Abstract:

Increasing pollution of the environment is beginning to be recognized as potential cause of nervous system reactions. Not only do we have these obvious pollutants to which people can react, but of even more basic importance is the observation that maladaptive central nervous system reactions can occur in susceptible people to otherwise nutritious food and/or chemicals.

Pigg, Susan (1984). "Lead Testing of Children Urged in Area Near Bathurst Smelter". Toronto Star, 1984.

Keywords: lead; health effects; testing

Abstract:

Toronto's Medical Officer of Health says that children living near the Toronto Refiners and Smelters Ltd. should be tested to determine whether they have unsafe levels of lead in their blood. Four times last year, lead emissions from the refinery exceeded environment ministry guidelines. More than 300 children in the South Riverdale area are being tested by a mobile health unit.

Pim, Linda R. (1981). "The Invisible Additives". Doubleday Canada Limited, Toronto Canada; 1981.

Keywords: environment; pesticides; heavy metals; chemicals; pollution; health effects

Abstract:

Environmental additives are chemicals which inadvertently contaminate our food. Such substances as chlordane (a pesticide residue in milk), aflatoxin (a poisonous mold on peanuts) and sulfonamide (a drug residue in pork) contaminate the food supply and present health hazards.

Pinkus, D. (1979). "Recommendations Pertaining to Lead". Local Board of Health, City of Toronto, Ontario; October 1979.

Keywords: lead; health effects; Toronto

Abstract:

A memo to the local Board of Health pertaining to proposed actions. Monitoring of expectant mothers, newborn infants and soil in certain areas is proposed. Children in the vicinity of lead plants should be continued. Suggestions are made concerning government-regulated lead levels. Lead in gasoline and coloured paper should be decreased. Physicians' awareness of lead poisoning should be increased. Research is suggested into the effects of lead on the brain and nervous system, learning and behaviour.

Plumlee, Lawrence; Coerr, Stanton (1979). "Panel Discussion: Role of High Risk Groups in the Derivation of Environmental Health Standards". Environmental Health Perspectives, Vol. 29, pp. 155-159; 1979.

Keywords: occupational health; environmental; health hazards; chemical susceptibility

Abstract:

There are a variety of syndromes which lead to hypersusceptibility, including exposure to high levels of chemicals, nutritional deficiency, and genetic predisposal to environmental chemical sensitivities. In setting standards for environmental contaminants, there must be the awareness that high risk groups are not a small portion of the population, but include virtually everyone from time to time, due to differences in susceptibility for each pollutant, nutritional factors, etc.

Priesnitz, W. K. (1979). "Herbicide Spray Action Kit". Natural Life Magazine, Jarvis Canada; 1979.

Keywords: herbicides; health hazards; spraying

Abstract:

Spraying of certain herbicides such as 2,4-D, Fenitrothion, 2,4,5-T, Dylox, etc., have been proven to have impacts on other non-target species with which they may come in contact, depending on the rate of application and the environmental conditions. Herbicides can enter the human system through contamination of water or food, through the skin if directly contacted, or through respiration of contaminated air. Some of the health effects are respiratory problems; burning eyes; bloody nose; nervous system disorders; infant problems such as retarded growth and spinabifida; female-related difficulties such as uterine bleeding, miscarriages, stillbirth, painful ovulation; liver and kidney problems; unusual susceptibility to colds, flues or other illnesses; headaches, nausea, dizziness; unusual reaction to alcohol; cancer; tumours; and birth defects. Addresses of citizens' groups and an action list for victims of spray drift are included.

Pryor, Gordon T.; Uyeno, Edward T.; Tilson, Hugh A.; Mitchell, Clifford L. (1983). "Assessment of Chemicals Using a Battery of Neurobehavioral Tests: A Comparative Study". Neurobehavioral Toxicology and Teratology, Vol. 5, pp. 91-117; 1983.

Keywords: neurotoxicity; lead; mercury; monosodium salicylate; analysis; neurobehavioural toxicity; pollution

Abstract:

8 chemicals (acrylamide, methyl mercury, chlordecone, tetraethyl tin, triethyl lead, lead acetate, arsenic, monosodium salicylate) were compared with reference to their toxic effect on the central nervous system. The battery of tests used may have utility in the assessment of the potential neurobehavioural toxicity of various chemicals because the results compared favourably with what is known about the chemicals from other experiments with animals and from human experience.

Pryor, Paul; Reno, Stanley J. (1981). "Health Hazard Evaluation Report, HETA 81-305-961, Aurora Schools". National Institute for Occupational Safety & Health, Hazard Evaluation and Technical Assistance Branch, Division of Surveillance, Hazard Evaluations, and Field Studies, Cincinnati OH; 1981.

Keywords: methyl alcohol; indoor air pollution; methanol; spirit duplicating machines; schools; Colorado

Abstract:

At the request of the Aurora Schools, Aurora Colorado, an environmental evaluation was conducted at the East Middle School by NIOSH on June 19, 1981. The request concerned the potential exposure to teacher aides from methyl alcohol during the use of spirit duplicators. All of the teacher aides experienced some adverse health effects, e.g. blurred vision, headaches, burning of the nose, sluggishness, dizziness, sore throat, dermatitis, chest tightness, and depression - symptoms characteristic of toxic exposure to methyl alcohol. On the basis of the environmental and medical data, NIOSH determined that a health hazard from excessive methyl alcohol existed to the teacher aides. This exposure exists to those operating the duplicator, as well as those persons present in the room while this process is in operation. Recommendations on elimination or controlling the health hazard are included.

Rand, George (1985). "Examining 'Sick' Buildings" Architecture, January 1985, pp. 80-83. For Reprints Inquire Graduate School of Architecture and Urban Planning, University of California, Los Angeles, CA USA 90024.

Keywords: health hazards; indoor air quality; sick buildings

Abstract: The author summarizes the results of a November 1984 seminar on indoor air quality sponsored by the American Institute of Architects and the California Council/AIA in response to growing concern over the "sick building syndrome". He quotes Harry Jacobs, president of the California Council: "So many different types of people use our buildings, from infants to the frail elderly in nursing homes, as well as the hardy people in between who may not be at all sensitive to polluted air. Research on health needs to be taken as seriously as the structural integrity of buildings, and it may mean adding a new type of consultant to the already long list of specialists needed to design a complex building. The architect may now have to master the languages of chemistry, biology, and medicine in order to competently orchestrate the health aspects of buildings."

Randolph, Theron G. (1976). "Air Pollution". from Human Ecology and Susceptibility to the Chemical Environment, fifth printing; part 111, pp. 35-62; Charles C. Thomas; 1976.

Keywords: indoor air pollution; outdoor air pollution; health effects; susceptibility; chemicals

Abstract:

Environmental pollutants, both indoor and outdoor, can have debilitating mental and physical effects, especially on highly susceptible persons. The major sources of air pollution in homes and public places, such as schools, are: fuels, solvents and their combustion products; refrigerants and spray containers; insecticides; sponge rubber; plastics; mechanical devices; automobiles; and scented cleaning products. Indoor chemical air pollution of schools as a contributing cause of poor scholastic performance of susceptible children and the dopiness and confusion of susceptible teachers is rarely diagnosed correctly. The problem presented by indoor air pollution is sufficiently acute to warrant the transfer of certain highly susceptible students and teachers to more satisfactorily located, constructed, equipped, heated and ventilated classrooms or schools.

Randolph, Theron G. (1976). "Human Ecology and Susceptibility to the Chemical Environment". Charles C. Thomas; 1976.

Keywords: human ecology; chemical susceptibility; pollution; health hazards

Abstract:

The author describes a wide range of clinical manifestations of maladaptation to the chemical environment - physical and mental, chronic and acute. The major chemical incitants are described and the tendency for susceptibility to spread to related materials to which cumulative exposures exist is emphasized. The diagnostic routine of comprehensive environmental control is explained. The author shows how finding and avoiding the inciting causes of illness are superior to treating the effects of illnesses.

Randolph, Theron G.; Moss, Ralph W. (1980). "An Alternative Approach to Allergies". Fitzhenry & Whiteside Limited, Toronto Canada; 1980.

Keywords: indoor air pollution; allergies; chemical sensitivities; health effects;

Abstract:

Many physical and mental illnesses are caused by our increasingly contaminated environment. For those who are susceptible, everyday chemicals (gas from the kitchen range, supermarket food additives, cleaning compounds, automobile exhaust, etc.) can be a cause of mental and physical disease. Use of chemicals in schools can contribute to the overall chemical and food problem and cause poor performance by both children and teachers. Poorly designed heating and cooking systems are a major source of trouble, as are janitorial chemicals, office and art supplies. Studies of indoor air pollution in schools have been conducted with resulting anecdotal proof of cause and remedy.

Rapp, Doris J. (1979). "Allergies and the Hyperactive Child". Simon & Schuster, New York NY; 1980.

Keywords: health effects; indoor air pollution; chemicals; allergies

Abstract:

Many exposures in school are capable of causing symptoms in children. Hyperactivity, fatigue, behaviour and personality problems, headaches, abdominal complaints, asthma, runny nose, watery eyes, hives are all symptoms of exposure to pollutants in schools.

Rapp, Doris (1979). "Allergies and the Hyperactive Child". Sovereign Books, Simon & Schuster; 1979.

Keywords: food allergies; hyperactivity; learning disabilities; minimal brain dysfunction; minimal brain damage

Abstract:

Medical reports from 1908 to the present indicate that a relationship between allergy and hyperactivity might exist. Anecdotal examples of the author's patients whose hyperactivity and learning difficulties were helped by diet modification are presented. Such things as easy distractibility, impulsiveness, emotional problems, poor coordination, perception problems, learning problems related to reading and spelling and short attention span are included under the category Minimal Brain Dysfunction. Hyperactivity, fatigue and behaviour and learning problems are often caused by medical problems such as allergies, anemia, hypoglycemia and lead poisoning.

Ray, Sammy M.; Trieff, Norman M. (1980). "Bioaccumulation of Anthropogenic Toxins in the Ecosystem". from Environment & Health, pp. 93-120; Norman M. Trieff, editor; Ann Arbor Science Publishers, Inc.; 1980.

Keywords: toxic compounds; DDT; PCBs; risk assessment; nonthreshold effects

Abstract:

Many natural and synthetic compounds have entered the ecosystem in the past 40 years. The adverse effects of many of these were unanticipated, in that these compounds are highly resistant to degradation by natural processes and there is often a pervasive buildup on a worldwide basis. There are two types of biological endpoints in the development of water quality criteria: nonthreshold and threshold effects. In the case of carcinogens, mutagens and teratogens, thresholds cannot be established because even extremely small doses must be assumed to result in a finite increase in the incidence of response. Thus, safe levels cannot be established.

Rea, William J. (1978). "Environmentally Triggered Cardiac Disease" Annals of Allergy, Vol. 40, No. 4, pp. 243-251; April 1978.

Keywords: cardiac arrhythmia; chest pain; sensitization;

Abstract: Twelve consecutive, highly selected patients with non-arteriosclerotic cardiac arrhythmias and/or chest pain refractory to medication, having various associated symptoms relating to smooth muscle sensitization, were studied in a rigidly controlled, relatively fume- and particle-free environment. The majority of signs and symptoms were cleared in 10 patients without medication while under environmental control and all arrhythmias were reproduced with controlled, repeated, individual blind and double-blind incitant challenges in 10 out of 12 patients. The incitants were common foods and chemicals to which the individual has been exposed frequently. Double-blind challenges with ambient doses of inhaled chemicals also reproduced the spectrum of arrhythmias (natural gas, odour of cigarette smoke, chlorine, perfume, pine-scented floor wash, ethyl alcohol, formaldehyde, phenol and pesticides). This myocardial involvement appeared to be part of a more generalized sensitization of smooth muscle. The distorted homeostatic mechanism included abnormal positive C-reactive protein, serum complements and T-and B-cell interactions in individual patients.

Rea, William J. (1979a). "The Environmental Aspects of Ear, Nose and Throat Disease: Part 1". University of Texas Health Science Center, Southwestern Medical School, Brookhaven Environmental Unit, Dallas TX. J.C.E.O.R.L. & Allergy, Vol. 41, No. 7, pp. 41-56; July 1979; Medical Digest. (0148-5180/79/0008-0041/250).

Keywords: ear; nose; throat; sensitivity; environmental overload;

Abstract: Ear, nose and throat involvement with environmental triggering factors appears to be the main early warning sign of environmentally triggered disease, according to this author. Sensitivity to odours seems to be the most common, many persons being intolerant of the odours of such substances as car exhaust, perfume, cigarette smoke, aerosol sprays, formaldehyde, alcohol, phenol, food, mould and dusts. Often rhinitis occurs. Recurrent sinusitis as well as severe otitis, various forms of vertigo (including Meniere's disease), and laryngeal edema are frequent presentations of the problem. Any portion of the respiratory system can be involved, resulting in such inflammatory diseases as recurrent bronchitis, bronchiectasis, and asthma. A masking phenomenon is also described which initially hides an adverse reaction.

Rea, William J. (1979b). "The Environmental Aspects of Ear, Nose and Throat Disease: Part II". University of Texas Health Science Center, Southwestern Medical School, Dept. of Thoracic Surgery. J.C.E.O.R.L. & Allergy Digest, Vol. 41, No. 8/9, pp. 41-54; August/September 1979. Reprint requests:

Human Ecology Research Foundation of the Southwest Inc., 12100 Webb Chapel Rd., Suite E305, Dallas TX USA 75234.

Keywords: ear; nose; throat; hypersensitivity; environmental control;

Abstract: This article reviews many immune parameters that can be measured to help the clinician define changes in the body homeostatic mechanisms that occur on exposure to offending environmental agents. The researcher suggests that allergic diseases can be prevented from developing into measurable end-stage inflammatory disease, if treated early. It is being shown that patients may do well for a few months to several years with injection therapy for pollen, dust, mould, and food sensitivities, and then suddenly start deteriorating. They may lose their food sensitivity but develop a chemical sensitivity problem. It is not certain why this spreading phenomenon occurs, but it appears to be due to an overload of synthetic chemicals. Treatment of chemical sensitivity is complex, because most treatment consists of avoidance.

Rea, William J. (1979c). "Diagnosing Food and Chemical Susceptibility". Environmental Health Centre, Dallas, TX USA. Continuing Education, pp. 47-48, 52-53, 57-59; September 1979.

Keywords: diagnosis; susceptibility; reactions; foods; chemicals;

Abstract: The author describes clinical experience in which a spectrum of disorders affecting smooth muscles, mucous membranes, and collagen in the respiratory, gastrointestinal, genitourinary, and vascular systems is manifested. The variety of symptoms presented are often mistaken for hypochondriasis, but actually are due to reactions to foods and chemicals found in the patient's home and work environments. Careful clinical histories should alert the physician, who can confirm suspicions by eliminating the potentially offending agents, and challenging the patient with them under controlled circumstances.

Rea, William J.; Bell, Iris R.; Suits, Charles W.; Smiley, Ralph E. (1978). "Food and Chemical Susceptibility after Environmental Chemical Overexposure: Case Histories". University of Texas Southwestern Medical School, Dallas TX; Stanford University School of Medicine, Stanford CA. Annals of Allergy, Vol. 41, No. 2, pp. 101-110; August 1978. Supported by the Human Ecology Research Foundation of the Southwest, Inc.; reprint requests: Dr. William J. Rea, 12110 Webb Chapel Rd., Suite E305, Dallas TX 75234.

Keywords: susceptibility; food; chemical; inflammatory disease;

Abstract: Twelve patients with overexposure to commonly used environmental chemicals were studied. After the overexposure all developed recurrent signs and symptoms of inflammatory type diseases that were the result of ambient chemical fumes in the air and home environments. A period of time in a relatively fume-free and particle-free environment cleared the majority of symptoms and signs without the use of medication. Double-blind rechallenge with ambient dose levels of synthetic chemicals reproduced most of the symptomatology. Laboratory findings included abnormalities in complement, T-lymphocytes, eosinophils and IgG. The data suggest that some chemicals can trigger and propagate certain non-malignant inflammatory diseases, and re-emphasize the seriousness of exposures to levels of some chemicals in our environment which were previously considered safe.

Once an individual is sensitized to a solitary chemical it is apparent that continued exposures result in a spreading phenomenon. Once this spreading occurs, reactions then proceed upon minute exposures. Spreading was demonstrated clearly in the patients in this series. After a massive exposure to one type of chemical the individual then became intolerant to ambient concentrations of many others. The mechanism of this spreading phenomenon is unclear at the present time.

Rea, William J.; Butler, Joel R.; Laseter, John L.; DeLeon, Ildefonso R. (1984). "Pesticides & Brain-function Changes in a Controlled Environment". Clinical Ecology, Vol. 11, No. 3, pp. 145-150; Summer 1984.

Keywords: pesticides; chlorinated hydrocarbons; MMPI, Bender-Gestalt, WAIS-R; neurotoxicity; psychological/brain function; environmental sensitivity; environmental control

Abstract:

The purpose of the present study was to determine the extent to which chlorinated hydrocarbon pesticides in environmentally sensitive patients would be reduced by Environmental Control Unit (ECU) treatment programs, and the correlation of brain-function/psychological test results with treatment effect. Before and after therapy studies were performed on 40 ECU patients with proven levels of blood pesticides. There was a significant decrease in magnitude of blood pesticides and a significant increase in performance on brain-function/psychological tests after ECU treatment. There was also a corresponding decrease in symptoms overall. It was concluded that rigid environmental controls in treatment strongly contributed to the decrease in blood pesticide levels. Further, a more serious psychological profile was associated with these patients who showed improvement consistent with treatment.

Reid, Lynne M. (1979). "Session on Disease Conditions Predisposing Afflicted Individuals to the Toxic Effects of Pollutants". Environmental Health Perspectives, Vol. 29, pp. 127-129; 1979.

Keywords: susceptibility; chemical pollution; air pollution; lung; children

Abstract:

Children with bronchiolitis, with cystic fibrosis, or children who have had asthma during childhood or have developed hyperlucency in the radiograph after childhood infection, are all those in whom exposure to industrial irritants or to an inclement environment may be serious. The hazard of tobacco smoking is an extremely significant factor in the susceptibility of an individual to a pollutant.

Reinhardt, Charles F. (1978). "Chemical Hypersusceptibility". Journal of Occupational Medicine, Vol. 20, No. 5, pp. 319-322; May 1978.

Keywords: human; genetics; environment; occupational; medicine; allergy; skin reactions

Abstract:

Occupational medicine is concerned with workers who react to certain substances at low levels, below the threshold concentration associated with injury or definite discomfort. These particular workers are distinctly more susceptible than the majority and may be inadequately protected by control procedures that will suffice quite well for most employees. Their hypersusceptibility may be inherited or acquired - if the latter, it may be primarily environmental, or it may be an interaction of several factors. Nutritional hypersusceptibility is indirectly traced to the environment.

Repace, James L.; Lowrey, Alfred H. (1980). "Indoor Air Pollution, Tobacco Smoke, and Public Health". Environmental Protection Agency; Laboratory for the Structure of Matter, Naval Research Laboratory, Washington DC. Science, Vol. 208, pp. 464-472; May 2, 1980; American Association for the Advancement of Science.

Keywords: human; physical; sociological; model; nonsmoker exposure; particulate; tobacco smoke;

Abstract: Indoor air pollution from tobacco smoke is pandemic. In the presence of tobacco smoke, many normal nonsmokers experience eye and throat irritation, headache, rhinitis and coughing; allergic persons report wheezing, sneezing and nausea as well. Particularly acute symptoms may be found in infants, children, persons with cardiovascular or respiratory disease and wearers of contact lenses. The authors undertook a systematic study of the levels of respirable suspended particulates in several common indoor environments. They showed that under the practical range of ventilation conditions and building occupation densities, the respirable suspended particulates levels generated by smokers overwhelm the effects of ventilation and inflict significant air pollution burdens. Smoking indoors may be incompatible with the goal of maintaining a high level of indoor air quality.

Repace, J.L. (1982). "Indoor Air Pollution". Environ. Int., Vol. 8, No. 1/6, pp. 21-36; 1982.

Keywords: review; indoor air pollution; research and control

Abstract:

As national trends accelerate towards the reduction of ventilation and infiltration rates in buildings, coupled with an increased use of synthetic chemicals in the indoor environment, a new phenomenon has arisen: the "sick building syndrome". Traditional approaches to environmental health developed for the outdoor air, or for the industrial occupational setting are inadequate to deal with this problem. It is argued that a comprehensive approach to the problem of indoor air pollution is necessary to protect public health.

Repace, J.L.; Lowrey, A.H. (1982). "Tobacco Smoke, Ventilation, and Indoor Air Quality". ASHRAE Transactions 88, part 1, pp. 895-914; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., 1791 Tullie Circle NE, Atlanta GA 30329; 1982.

Keywords: tobacco smoke; indoor air pollution; lung cancer; passive smoking

Abstract:

Cigarette smoking has been found to be causally related to cancer, cardiovascular disease, and pulmonary disease. Based on a 1,078,894 person prospective epidemiological study covering 25 states, statistically significant dose-response relationships between exposure to tobacco smoke and loss of life expectancy have been calculated. From examining the data according to mortality by degree of inhalation of tobacco smoke, it can be shown that even a limited amount of exposure to tobacco smoke carries a greatly increased risk of premature mortality, a fact that has great relevance for the problem of passive smoking. Breathing of ambient tobacco smoke by nonsmokers carries a significantly increased risk of morbidity and mortality.

Repace, James L. (1983). "Effect of Ventilation on Passive Smoking Risk in a Model Workplace". US Environmental Protection Agency, Washington DC 20460; 1983.

Keywords: tobacco smoke; occupational health; ventilation; passive smoking; indoor air pollution

Abstract:

An estimate of the variation of nonsmokers' lung cancer risk from so-called passive or involuntary smoking is given as a function of ventilation rate in a typical office, at an occupancy of 7 persons/100 m^2 (per 1000 ft^2) as specified under ASHRAE Standard 62-1981, Ventilation For Acceptable Indoor Air Quality. Assuming one third of the office workers are smokers who smoke at the average rate of two cigarettes per hour, the nonsmoking office workers exposed to environmental tobacco smoke for a 40-year period under the ventilation rate recommended by the standard would be subject to an estimated lifetime involuntary risk of about 250 per 100,000. This risk is 250 times the maximum lifetime value considered acceptable under commonly used environmental criteria for carcinogenic contaminants in air, water or food. Practical increases in makeup air or assists by air cleaning, although helpful, cannot reduce the risk to an acceptable level.

Repace, James L. (1983). "Risks of Passive Smoking". University of Maryland, Center for Philosophy and Public Policy, College Park, Maryland 20742 USA; August, 1983.

Keywords: passive; cigarette smoking; tobacco; nonsmokers; indoor air pollution; medical; legal; social; problems; health hazards; ambient

Abstract:

The risks to nonsmokers from breathing indoor air pollution from tobacco smoke are discussed from medical, legal, social, historical and philosophical points of view. Problems encountered by nonsmokers who are hypersensitive to tobacco smoke are contrasted with chronic risks to normal nonsmokers. Ambient tobacco smoke is compared to hazardous outdoor air pollutants and the products of other human activities which are regulated by society, and it is argued that failure to regulate indoor smoking will invite increasing confrontation and social dissension between nonsmokers, smokers, and employers, since the nonsmoker's claim on clean indoor air is morally superior to the smoker's right to pollute.

Repace, James L.; Lowrey, Alfred H. (1983). "Modeling Exposure of Nonsmokers to Ambient Tobacco Smoke". Air Pollution Control Association; August, 1983.

Keywords: passive smoking; tobacco smoke; indoor air pollution; health hazards

Abstract:

The authors have modelled the exposure of the nonsmoking US population to the particulate phase of tobacco smoke from indoor air pollution in buildings. It was estimated that the average US nonsmoker of working age

receives an exposure of 1.4 mg per day, a weighted average taken over exposures encountered both at home and at work. Estimates show that the ratio of workplace dose to the exposure received at home is nearly 4:1, indicating that, on the average, the workplace is a more important source of exposure than the home environment. Such estimates of exposure should prove useful both for assessing exposure in epidemiological studies of passive smoking, and for carcinogenic risk assessment, as well as for estimating total population exposure in epidemiological studies of the health effects of particulate air pollution.

Repace, James L.; Lowrey, Alfred H. (1984). "A Proposed Indoor Air Quality Standard for Ambient Tobacco Smoke". Swedish Council for Building Research, Stockholm Sweden; pp. 235-239; 1984.

Keywords: indoor air pollution; tobacco smoke; air quality standards

Abstract:

The authors propose an indoor air quality standard for ambient tobacco smoke particles for a typical US workplace, based upon limiting the involuntary carcinogenic risk to a nonsmoker from passive smoking to 3×10^{-7} annually, corresponding to a 1 per 100,000 risk for a 40-year working life. To achieve this level of risk, the maximum permissible annual average of the daily workplace concentrations must be 0.75 micrograms per cubic meter. At typical smoking occupancies for an office, achieving the standard would require impractical amounts of ventilation or prohibitive costs for air cleaning equipment. It appears that complete physical separation of smokers and nonsmokers or prohibition of workplace smoking are the only practical control measures.

Repace, James L.; Ott, Wayne R.; Wallace, Lance A. (1980). "Total Human Exposure to Air Pollution". Air Pollution Control Association; 1980.

Keywords: indoor air pollution; outdoor air pollution; exposure rates; fixed monitoring stations

Abstract:

A number of studies have shown that fixed monitoring stations do not accurately reflect the exposure of the population to outdoor pollutants in the indoor environment. Furthermore, various studies have indicated that indoor exposures to air pollutants can be very important contributors to air pollution burdens of the population. Factors affecting an individual's "exposure" are explored by modelling and measurement, and research needs and implications for regulatory action are discussed.

Repace, James L.; Seba, Douglas B.; Lowrey, Alfred H.; Gregory, Thomas W. (1984). "Effect of Negative Ion Generators on Ambient Tobacco Smoke". Clinical Ecology, Vol. 11, No. 2, pp. 90-94; Winter 1983-84.

Keywords: negative ion generators; tobacco smoke; air cleaners; aerosol measurements; ventilation engineering; indoor air pollution

Abstract:

With the recognition that indoor air pollution can adversely affect the health of building inhabitants, the negative ion generator has been suggested as a device for the removal of pollutants. This paper describes the experiments designed to investigate the efficiency of negative ion generators for removing ambient tobacco aerosol from typical indoor spaces, such as residences, churches and schools. In every case, the ionizers accelerated the deposition rate of the particulate phase on the room surfaces by factors of from 3 to 18. Ionizers may be ineffective in removing gas-phase pollutants from indoor combustion and should not be considered as substitutes for ventilation or source control, but they may be useful adjuncts to primary ventilation systems under conditions where smoking cannot be prevented.

Repace, James (1984). "Tobacco Smoke: The Double Standard". QQ - Report from the Center for Philosophy & Public Policy, University of Maryland, College Park, Maryland 20742; Vol. 4, No. 1, pp. 6-8; Winter 1984.

Keywords: tobacco smoke; indoor air pollution; health hazards; public policy

Abstract:

A research scientist blasts the double standard that treats air pollution more leniently when emitted from a lit cigarette than from a factory smokestack.

Rieber, Elaine R. (1984). "The Question of Safety in Secondary School Science Laboratories". Canadian Council on Children and Youth, Ottawa Canada; May 1984.

Keywords: mercury vapour; science laboratories; toxic chemicals; indoor air pollution; schools

Abstract:

This paper was prepared in response to a 1983 letter from a secondary school teacher in Quebec concerning the issue of mercury vapour in science labs and its potential harmful effect on the health of children. It was concluded that there are no provincial regulations with respect to safety standards for secondary school science labs, and no systematic monitoring of safety conditions exists at any level.

Riley, E.C.; Murphy, G.; Riley, R.L. (1978). "Airborne Spread of Measles in a Suburban Elementary School". American Journal of Epidemiology, Vol. 107, No. 5, pp. 421-432; 1978.

Keywords: epidemiology; infection; measles; measles vaccine; models theoretical; statistics; vaccination; ventilation

Abstract:

A measles epidemic in a modern suburban elementary school in upstate New York in Spring, 1974 is analyzed in terms of a model which provides a basis for apportioning the chance of infection from classmates sharing the same home room, from airborne organisms recirculated by the ventilating system, and from exposure in school buses. The epidemic was notable because of its explosive nature and its occurrence in a school where 97% of the children had been vaccinated. Many had been vaccinated at less than one year of age. The index case was a girl in second grade who produced 28 secondary cases in 14 different classrooms. Organisms recirculated by the ventilating system were strongly implicated. After two subsequent generations, 60 children had been infected, and the epidemic subsided. From estimates of major physical and biologic factors, it was possible to calculate that the index case produced approx. 93 units of airborne infection per minute. The exceptional infectiousness of the index case, inadequate immunization of many of the children, and the high percentage of air recirculated throughout the school, are believed to account for the extent and sharpness of the outbreak.

Rimland, Bernard; and Larson, Gerald E. (1981). "Nutritional Approaches to the Reduction of Criminality, Delinquency and Violence". Institute for Child Behavior Research, San Diego, California. Journal of Applied Nutrition, Volume 33, Number 2, 1981, pp. 116-133.

Keywords: criminal behaviour; violence; delinquency; nutrition; environment;

Abstract:

The traditional approaches to the treatment of offenders, through counselling and psychosocial rehabilitation, have in repeated studies been found to be useless or counterproductive. These methods assume antisocial behaviour is primarily sociogenic in origin. The author presents another point of view, that much crime, particularly violent crime, is caused by biological malfunctioning of the brain. The strong association between learning disabilities and antisocial behaviour suggests that both learning problems and problems with the law may stem from a common cause - brain malfunction. Maternal smoking, poor nutrition, toxic metal and other chemical exposure, and food allergies are among the adverse factors considered as causes of brain malfunction in youth.

Rimland, Bernard; Larson, Gerald E. (1983). "Hair Mineral Analysis and Behavior: An Analysis of 51 Studies". Journal of Learning Disabilities; Vol. 16, No. 5, pp. 279-285; May 1983.

Keywords: behaviour; learning disabilities; allergy; environmental; heavy metals;

Abstract:

An attempt was made to compile and summarize all available studies on the relationship between hair mineral levels and various aspects of human behaviour. The 51 studies located covered a wide range of behaviour, from learning disabilities (10 studies) through hyperactivity (5 studies) to giftedness and intelligence (4 studies). High levels of certain minerals, especially lead and cadmium, and low levels of other minerals, especially potassium and sodium, tend to be associated with undesirable behaviour. There is a need for vigorous attempts to eliminate sources of environmental exposure to heavy metals and for further study of the role of mineral excesses and deficiencies in human health and behaviour.

Rittfeldt, Lars; Sandberg, Maria; and Ahlberg, Mats S. (1984). "Indoor Air Pollutants Due to Vinyl Floor Tiles". National Defence Research Inst. NBC Department, S-901 82 Umea, Sweden. Proceedings, 3rd International Conference on Indoor Air Quality and Climate, held in Stockholm, Sweden, August 20-24, 1984. Volume 3: Sensory and Hyperreactivity Reactions to Sick Buildings, pp. 297-301.

Keywords: vinyl tiles; floors; butyl benzyl phthalate; benzyl chloride; benzal chloride; building illness;

Abstract: Most pollutants emitted from vinyl floor tiles are found to originate from the surface film and the patterned film used in the manufacturing of the tiles. These films are plasticized with butyl benzyl phthalate, which makes the tiles easy to clean. Butyl benzyl phthalate was shown to be contaminated with benzyl chloride and benzal chloride, compounds which are irritating to the eyes and respiratory mucosa and which also are carcinogenic. The concentrations in the films and in the vinyl floor tiles of these substances were measured and their emission rates from a newly produced tile were determined. The author suggests that the emission of benzyl chloride and benzal chloride from vinyl floor tiles plasticized with butyl benzyl phthalate may be a factor contributing to the irritations in so-called "temporary sick buildings".

Rodier, Patricia, M.; Aschner, Michael; Sager, Polly R. (1984) "Mitotic Arrest in the Developing CNS After Prenatal Exposure to Methylmercury". Neurobehav. Toxicol. Teratol., Vol 6, No. 5, pp: 379-385; 1984.

Keywords: methylmercury; mitosis; cerebral cortex; hippocampus; cerebellum

Abstract:

Methylmercury is toxic both to the mature and developing nervous system. One mechanism of its effect on the developing neonatal cerebellum is its interference with cell production by mitotic arrest.

Rogers, Sherry A. (1985). "When Your Home Makes You Sick". Bestways Magazine, pp. 8,11; February 1985.

Keywords: formaldehyde; indoor air pollution; chemical exposures; health hazards;

Abstract:

Formaldehyde is just one of a variety of chemicals capable of causing environmentally-induced illness. During the past 10 years, people with recently foam-insulated homes have enabled us to study on a grand scale hundreds of victims and their symptoms. Common symptoms include headaches, nausea, dizziness, lethargy, flushing, laryngitis, depression, dopiness, extreme weakness, muscle spasms, joint or muscle pains, vomiting, violent mood swings, and confusion or disorientation. Case studies are presented of a student exposed to formaldehyde in carpets and panelling as well as leaking gas jets in the school science lab, and a teacher exposed to formaldehyde from building materials used in school renovations.

Ruprecht, Tony (1984a). "Proposed Hazardous Substances Disclosure Act, 1984". Legislative Assembly, Ontario, Canada (Private Members' Bill, unpublished).

Keywords: hazardous substances; toxic chemicals; disclosure; storage; disposal;

Abstract:

The purpose of the proposed Act, a private member's Bill that was intended for introduction in the Ontario Legislature in the fall of 1984, is to allow the Minister of the Environment and municipalities to require public and detailed disclosure of the production, use, storage and disposal of hazardous substances by individual businesses. The author hopes to introduce the Bill during 1985.

Ruprecht, Tony (1984b). "Summary - Brief to the Commission on Regulatory Control of Mobile PCB Destruction Facilities, November 20, 1984". Tony Ruprecht, MPP, Parkdale Office, 1264 College St., Toronto Canada M6H 1C2; November 20, 1984.

Keywords: PCB destruction; mobile incineration; regulatory commission

Abstract:

The proposal to incinerate PCBs in mobile incinerator units raises critical community issues and questions regarding the Ministry of Environment's approach towards hazardous materials management. The author is opposed to the burning of PCBs at the CGE Lansdowne plant, or anywhere within the city of Toronto, or within densely populated areas anywhere in Ontario.

Russell-Manning, Betsy (1985) "Candida - Silver (mercury) Fillings and the Immune System". Greensward Press, Box 99472, San Francisco CA 94109; 1985.

Keywords: mercury; candida; environmental illness

Saric, Marko; Fugas, Mirka; Hrustic, Omer (1981). "Effects of Urban Air Pollution on School-Age Children". Archives of Environmental Health, Vol. 36, No. 3, pp. 101-108; 1981.

Keywords: air pollution; sulphur dioxide; smoke; children; health effects; respiratory health

Abstract:

From November 1977 to March 1978, forced expiratory volumes (FEVs) of 78 second graders living in a high sulphur dioxide and smoke pollution area were compared with FEVs of 70 second graders living in a clean air area. The incidence of acute respiratory diseases in these children and their families was also comparatively studied during the same period. Indoor and outdoor measurements of sulphur dioxide and smoke, as well as additional measurements of suspended particulate matter (SPM) and sulfate were conducted. The results of the study suggest that at the actual average annual exposure to sulphur dioxide, smoke, and SPM of 70-80 ug/m^3, 60-80 ug/m^3, and 130-200 ug/m^3, respectively, with frequent exposures to three to five times higher daily sulphur dioxide and smoke concentrations and two times higher daily concentrations of SPM during the heating season, certain effects on the ventilatory functions and occurrence of acute respiratory diseases can be expected.

Schauss, Alexander (1980). "Diet, Crime and Delinquency". Parker House, Berkeley CA 94704; 1980.

Keywords: blood sugar; lead; food additives; allergies; nutrition; criminology; behaviour; health effects; pollution; learning

Abstract:

Junk food diets, sugar starvation, vitamin deficiencies, lead pollution, and food allergies can convert a normal brain into a criminal mind.

Children absorb and retain a greater percentage of ingested lead than adults. Lead levels formerly considered safe have recently been shown to increase abnormal behaviour, cause learning difficulties and reduce intelligence.

Schauss, Alexander (1980). "Lead, Behavior and Criminality". Parker House, Berkeley CA; 1980.

Keywords: lead; learning difficulties; intelligence; toxicity; screening

Abstract:

Lead levels formerly considered safe have recently been shown to increase abnormal behaviour, cause learning difficulties and reduce intelligence. Children can absorb enough lead to impair their performance on tests of reasoning, coordination, intelligence and reading. Some symptoms of lead toxicity are hyperactivity, perceptual disorders, mental retardation, fatigue, irritability, temper tantrums, learning disabilities, speech disturbances, perceptual motor dysfunctions, and emotional or behavioural problems. There are two new techniques helpful in determining heavy metal concentrations, replacing blood tests. These are hematofluorometry and hair trace mineral analysis.

Schifftner, Kenneth C.; Hesketh, Howard (1983). "Diagnostic Test Burns on Solid, Liquid and Slurry Waste Materials". Air Pollution Control Assoc.; June 1983.

Keywords: incineration; industrial wastes; air pollution control; simulation; diagnostic test burning

Abstract:

Diagnostic test burns are suggested during the planning and engineering stages of programs for waste incineration. They permit the evaluation of alternative fuel mixes, adjustments to the operation of the incinerator, and allow the forecasting of emissions potentials. The lessons learned on a small scale save the expense of correcting problems on a large scale. The testing should not and need not be expensive, but should show the relative effects of changing variable or system configurations, not the exact emissions rates. These trends are instructive in developing proper control techniques, forming safe operating procedures, and protecting the community surrounding the system from emissions during any kind of incineration.

Schreiter, Anne (1984a). "Human Ecology in the Schools". Human Ecology Foundation of Canada, Kitchener Branch; 1984.

Keywords: indoor air pollution; health hazards; schools; environmental illness; chemical susceptibility; pollutants; Kitchener

Abstract:

This article outlines causes of and solutions for chemically sensitivity in children in the school system. Suggestions are made for reducing the chemical load of the children and teachers and solutions are presented that have been used in actual situations of chemical sensitivity.

Schreiter, Anne (1984b). "A Follow-up to Human Ecology in the Schools". The Human Ecology Foundation of Canada, Kitchener Branch; 1984.

Keywords: indoor air pollution; health hazards; schools; environmental illness; chemical susceptibility; pollutants; Kitchener

Abstract:

Suggestions and solutions for chemically sensitivity in children in the school system. Suggestions are made for reducing the chemical load of the children and teachers, including that smoking be banned on school property.

Schroeder, Henry A. (1973). "Cadmium, High Blood Pressure and Water". from Trace Elements and Man; chapter VIII, pp. 97-114; Devin-Adair Co.; 1973.

Keywords: cadmium; hypertension; water pollution; air pollution; health hazards; zinc

Abstract:

There is evidence that cadmium from refined foods, water pipes and contaminated air and water accumulates in human kidneys and causes hypertension or high blood pressure.

Schwarzbach, E. (1982). "Workplace Pollution by Exhaust Gases from Cars and Internal Combustion Engines". Zentralbl. Arbeitsmed., Arbeitsschutx, Prophyl. Ergon., Vol. 32, No. 1, pp. 14-16; 1982.

Keywords: review; workplace pollution; air pollution by exhaust gases; indoor air pollution

Seifert, Bernd; Drews, Marianne; Aurand, K. (1984). "Indoor Heavy Metal Exposure of the Population Around a Secondary Lead Smelter". Indoor Air, Vol. 2, pp. 177-181; Swedish Council for Building Research, Stockholm Sweden, 1984.

Keywords: lead; indoor air pollution; passive sampling; cadmium

Abstract:

In the course of earlier studies, it had been observed that measuring the concentration of heavy metals in deposited dust is a much better means to characterize the exposure of population groups living close to emission sources than analysing samples of suspended particulate matter. Thus, a simple method has been developed in which house dust collected with a passive sampler is used for a rapid screening of the heavy metal content of dust deposited in houses located near a source. Analysing such dust samples for lead and cadmium permitted the authors to detect the most polluted spots in an area surrounding a secondary lead smelter at Oker, Federal Republic of Germany. The method as well as the results of field measurements carried out in 1982 are discussed.

Severs, Richard K. (1980). "Air Pollution and Health". from Environment and Health, chapter 5, pp. 123-162; Trieff, Norman M. editor; Ann Arbor Science Publishers Inc.; 1980.

Keywords: air pollution; health effects; synergistic effect; pulmonary effects; sulphur dioxide; nitrogen dioxide; photochemical oxidants; carbon monoxide; hydrocarbons; carcinogens

Abstract:

Synergistic effects of pollutants have been demonstrated. Air pollution aggravates existing disease conditions or puts at higher risk those predisposed to ill health. Nonspecific measurements of air pollutants that are associated with disease states in humans should be treated as though they were surrogates for causal factors. Little relevance comes from studies that expose humans to only one pollutant at a time. Adverse effects of the following air pollutants on the cardiopulmonary system are chronicled: sulphur dioxide, nitrogen dioxide, photochemical oxidants, carbon monoxide, hydrocarbons, and carcinogens.

Shearer, Ruth W. (1983) "Health Effects of 2,4-D Herbicide". April 1983.

Keywords: 2,4-D; phenoxy herbicides; health effects

Abstract:

The author is familiar with the medical histories of more than 30 people who have been acutely poisoned by 2,4-D alone or in combination with other herbicides. Acute symptoms include nausea, vomiting, diarrhea, headache, temporary loss of vision, weakness, burning eyes, sore throat with burning in chest, and difficulty in thinking. Residual effects include impairment, bleeding tendency, concentration and memory problems, and hypersensitivity to non-physiologic chemicals which prevents participation in most modern job environments. Likely carcinogenicity is discussed in detail, including a discussion of recent animal studies.

Shearer, Ruth (1983) "On Safe Use of Pesticides". 1983.

Keywords: pesticides; myths; hazards

Abstract:

The idea that people can be exposed to pesticides safely is based on a number of faulty assumptions. These include: pesticides registered with the government have passed stringent health testing; a no-observable-effect level can be determined for any pesticide; pesticides are safe when used according to the label; after a pesticide has been excreted from the body, all poisoning symptoms are gone.

Silver, Francis (1976). "Carbon Monoxide". from Clinical Ecology, Dickey, Lawrence D., ed.; pp. 269-272; Charles C. Thomas; 1976.

Keywords: carbon monoxide; health effects; carboxyhemoglobin

Abstract:

Easily measurable impairment of some of the more delicate senses can be measured at 1% or 2% of hemoglobin bound by carbon monoxide. This blood level can result from five to ten parts per million in the breathed air. At 3% to 5% carboxyhemoglobin, ordinary intellectual functioning starts to suffer in a way that can be measured. Creativity and finer intellectual coordination may be harmed at much lower levels. It is difficult to measure and document such low levels of impairment to intellectual functioning, coordination and creativity, hence the many studies claiming to report "no effect" after greater CO exposure.

Silver, Francis (1976). "More on the Plastic Problem". Ecologist, p. 9; Environmental Health Assoc. of Greater Washington, Box 3162, Falls Church VA 22043; 1976.

Keywords: plastic; health effects; tri-cresyl phosphate

Abstract:

Many people experience burning sensations, loss of attention and drowsiness when sitting on plastic chairs. It is possible that incidences of misbehaviour by children such as wrecking school buses, hyperactivity and learning difficulties may all be influenced by exposure to tri-cresyl phosphate in the vinyl seating of the buses, school seats or cleaning agents.

Silverman, Frances (1979). "Asthma and Respiratory Irritants (Ozone)". Environmental Health Perspectives, Vol. 29, pp. 131-136; 1979.

Keywords: ozone; air pollution; susceptibility; health hazards; respiratory irritants; asthma;

Abstract:

Asthmatics appear to be more susceptible to the effects of air pollutants than nonasthmatics. The present studies were undertaken to examine the effects of exposing asthmatics to ozone concentrations that occur in the environment and indicate that acute exposures to ozone at realistic concentrations in the environment can produce adverse responses in some asthmatics.

Silverman, F.; Corey, P.; Mintz, S.; and Hosein, R.H. (1985). "Factors That Influence Assessments of Health Effects of Air Pollution. Gage Research Institute, University of Toronto. Proceedings, 3rd International Conference on Indoor Air Quality and Climate, held in Stockholm, Sweden, August 20-24, 1984. Volume 4: Chemical Characterization and Personal Exposure, pp. 123-127.

Keywords: health effects; air pollution; asthmatics; personal samplers;

Abstract: Scientists at the Gage Research Institute, University of Toronto examined the health effects of air pollution in asthmatics and healthy nonasthmatics. The study took into account the fact that the indoor environment may be a modifier of human exposure to air pollution, by using small portable multi-pollutant samplers for nitrogen dioxide, sulphur dioxide, and particulate matter.

Singh, B.A.; and Kawasaki, J. (1984). "Investigation of an Odour Incident in the Junction Triangle on January 12, 1984". Ministry of the Environment, Central Region, April 9, 1984. (Tabled at Junction Triangle Environmental Liaison Committee Meeting, April 9, 1984).

Keywords: Junction Triangle; odour incident; styrene; fibreglass bathtubs; dispersal; Campbell Avenue open air skating rink;

Abstract: An incident on January 12, 1984 was investigated in which several school children and teachers from Perth Avenue Public School were exposed to odours at the Campbell Avenue open air skating rink.

Several complaints of illnesses and absences from school were attributed to the exposure and led to the investigation.

The source of the odours was assumed to be styrene from American Standard's fibreglass bathtub operation. Ministry staff thought that the particular circumstances which caused the odours were unusual and infrequent. They met with American Standard officials and reviewed their operations but no changes were recommended. The report states that the company's link with the incident is based on circumstantial evidence. The school has developed a procedure for immediate contact of the Ministry in future suspected cases of air pollution. (see pp. 76/77 for further discussion).

Small, Bruce M. and Small, Barbara J. (1980) "Sunnyhill - The Health Story of the 80's". Small and Associates, Publishers, R.R.#1, Goodwood, Ont. L0C 1A0.

Keywords: chemical susceptibility; low-pollution housing; health; allergic children;

Abstract:

This book describes the events in the lives of the authors that related to their condition - a general susceptibility to low-level chemical exposures and multiple food and inhalant allergies. It includes the story behind Sunnyhill Research Centre, a special low-pollution dwelling built by the authors northeast of Toronto for education of persons who have been diagnosed as being chemically sensitive. Descriptions of the diagnosis and successful control of their daughter Carolyn's allergies may be of particular use to parents of allergic children.

Small, Bruce M. (1982). "Chemical Susceptibility and Urea-Formaldehyde Foam Insulation". National Research Council of Canada, Division of Building Research; February 1982.

Keywords: urea-formaldehyde foam insulation; susceptibility; sensitivity; indoor air pollution

Abstract:

Not everyone responds the same way when exposed to pollutants in the air. Initial observations of people exposed to formaldehyde and other gases emitted by Urea-formaldehyde Foam Insulation show a wide variation. But recent evidence indicates that there may be a larger group who are in general more susceptible to low levels of chemical exposures of various kinds. Preliminary reports indicate that some people who are exposed to UFFI gases, and who have no previous indication of chemical susceptibility, may become generally chemically susceptible as a result of the exposure. There is also evidence that for some people other allergic-like sensitivities may also have been triggered by the UFFI gas exposure, even in cases with no obvious history of allergy.

Small, Bruce M. (1982). "Environmental Health Factors in Falling Accidents". National Research Council of Canada, Div. of Electrical Engineering, Medical Engineering Section, Ottawa Canada; October, 1982.

Keywords: air pollution; indoor; falling accidents; health effects environmental health factors; perceptual changes;

Abstract:

This study surveys the literature and other sources of expertise to assess the possible role of environmental air pollutants in "accidents involving falls" in buildings. Evidence is presented which shows that certain pollutants can cause both gross and subtle perceptual and motor ability changes which clearly add to the risk of a falling accident occurring. In addition, it is shown that some people can be much more highly susceptible to common indoor air pollutants than others, and specific precautions to help such persons minimize risk of accidents are outlined. The study recommends that indoor air pollution should be recognized as both a health problem and a safety problem, and a number of followup investigations are suggested.

Small, Bruce M. (1983) "Indoor Air Pollution and Housing Technology" By Bruce M. Small and Associates Limited for Canada Mortgage and Housing Corporation, funded under Part V of the National Housing Act. Original printing August 1983 by CMHC. Reprinted 1984 and now available from Technology and Health Foundation, R.R.#1, Goodwood, Ontario L0C 1A0.

Keywords: housing, indoor air quality; low-pollution buildings; Sunnyhill Research Centre; chemical susceptibility; housing technology

Abstract:

This 300-page report describes in detail the various potential sources of indoor air pollution that could be present in Canadian homes. For each, the literature available at the time was reviewed and incidence, standards, and possible health effects are documented. Approximately one-third of the report is devoted to describing the design features used in the author's Sunnyhill Research Centre, a special low-pollution residence and educational establishment northeast of Toronto. The report describes informal methods which chemically susceptible individuals may use to test for compatible building materials, and also discusses which of the various low-pollution design techniques might be most applicable for use in housing for the general population.

Small, Bruce M. (1984). "Update on Indoor Air Quality Studies". American Academy of Environmental Medicine, 18th Advanced Seminar in Clinical Ecology Program, pp. 14-15; October 1984.

Keywords: indoor air pollution; health hazards; susceptible population

Abstract:

When populations with common risk factors under exposure to various pollutants are added up, greater than a quarter of the population is seen to be at risk, with the known chemically susceptible population representing only a small part of this group. Those at greatest risk from increased pollutant exposure include pregnant women and young infants, the elderly, other persons with existing respiratory and cardiac problems, the chemically susceptible portion of the allergic population, and smokers.

Smith, Cathy (1985). "Letter to the Prime Minister of Canada Concerning Budget Cuts in Environmental and Toxicological Programs, February 13, 1985". Canadian Association for Children and Adults with Learning Disabilities, Maison Kildare House, 323 Chapel, Suite 101, Ottawa, K1N 7Z2.

Keywords: environmental programs; toxicology; ACLD; behaviour; productivity; neurobehavioural measures;

Abstract:

This letter emphasizes the need for further research on the effects of toxins on human health, productivity and human quality. The author states that there is new mounting scientific evidence showing that the human brain, especially in unborn and young children, is particularly vulnerable to toxic insult, and that such effects appear to be permanent.

Smith, Lendon (1979). "Feed Your Kids Right". Dell Publishing Co., Inc.; 1979.

Keywords: learning; health; food additives; allergies; pollution; food; diet;

Abstract:

Illness, hyperactivity, learning problems and stress can be prevented by diet and removal of environmental pollutants.

Smolen, M. (1984). "Wood Foundations". Rodale's New Shelter, Vol. V, No. 5, pp. 66-70; May/June 1984.

Keywords: wood preservatives

Abstract:

This article describes how to construct an all-weather wood foundation from plywood and lumber that has been pressure-treated with preservatives. The use of chromated copper arsenates and ammoniacal copper arsenate as lumber preservatives is discussed in light of some government concern about negative health effects, and precautions are urged so that children and pets don't come into contact with the treated wood.

Solomon, R.L.; Natusch, D.F.S. (1977). "Environmental Contamination by Lead and Other Heavy Metals. Vol. 3. Distribution and Characterization of Urban Dusts". US Govt.; July 1977.

Keywords: lead; pollution; environmental surveys; sources; cadmium; soil; ecology; urban areas; dust; air pollution; heavy metals; public health; sampling; aerosols; systems analysis; automobile exhaust; trace elements; tetraethyl lead; paints; chemical analysis; transport properties; organic compounds; particle size; fly ash; Illinois; indoor air pollution; air pollution sampling; water pollution sampling; particulates

Abstract:

This volume describes studies of the sources and distribution of lead and cadmium in the dust and soils of an urban area. The work was conducted as part of a larger effort to identify the sources, distribution, and fate of lead and other heavy metals in both the rural and urban environments. Urban soils and settled dusts are of special interest from the standpoint of human health because it is with these potential carriers of heavy metal pollutants that humans are most likely to come into contact. It is shown that current urban concentrations of heavy metals in dusts and soils, both indoors and outdoors, could have a significant impact on human health. A field survey of soils and settled dusts was conducted in the small urban area of Champaign-Urbana, Illinois. Objectives of the studies were: to determine where high levels of lead and cadmium are found in urban areas; to determine the sources of lead, cadmium, and polycyclic organic matter (POM); and to determine those physical and chemical properties of lead, cadmium, and POM which determine their environmental impact. Samples collected from several types of locations in an urban environment during the field survey were analyzed for their lead and cadmium content to determine the general distribution of these elements within the area and to identify local patterns of their concentrations in and around selected buildings.

South Riverdale Occupational Health Group and the Toronto Occupational Health Resource Committee (1985). "The South Riverdale Occupational Health Research Project". South Riverdale Community Health Centre, 126 Pape Avenue, Toronto M4M 2V8.

Keywords: pollution sources; South Riverdale; occupational health;

Abstract:

This report lists over 200 workplaces in Riverdale, grouped into categories such as auto servicing, the plastic industry, detergent and soap industry, dry cleaning industry, hairdressers, bakeries, meat packers, etc. Included in the report are the general and specific health hazards of each industry and the resulting effects on the workers.

Speizer, Frank E.; Ferris, Benjamin, Jr.; Bishop, Yvonne M.M.; Spengler, John (1980). "Respiratory Disease Rates and Pulmonary Function in Children Associated with N02 Exposure". American Review of Respiratory Disease, Vol. 121, No. 1; pp. 3-10; Jan. 1980.

Keywords: air pollutants - adverse effects; environmental; child; female; forced expiratory volume; fossil fuels; human; lung - physiopathology; male; Massachusetts; nitrogen dioxide; population surveillance; respiratory tract diseases; chemically induced; socioeconomic factors; vital capacity; nitrogen dioxide;

Abstract:

As part of a long-range, prospective study of the health effects of air pollution, approximately 8,000 children from 6 years to 10 years of age from 6 communities had questionnaires completed by their parents and had simple spirometry performed in school. Comparisons were made between children living in homes with gas stoves and those living in homes with electric stoves. Children from households with gas stoves had a greater history of respiratory illness before age 2 and small but significantly lower levels of forced expiratory volume (FEV), and forced vital capacity (FVC) corrected for height. These findings were not explained by differences in social class or by parental smoking habits. Measurements taken in the homes for 24 hour periods showed that NO2 levels were 4 to 7 times higher in homes with gas stoves than in homes with electric stoves. However, these 24 hour measurements were generally well below the current US 24 hour outdoor standard of 100 ug/m^3. Short-term peak exposures, which were in excess of 1,100 ug/m^3, regularly occurred in kitchens. Further work will be required to determine the importance of these short-term peaks in explaining the effects noted.

Spengler, John D.; Sexton, Ken (1983). "Indoor Air Pollution: A Public Health Perspective". SCIENCE, Vol. 221, No. 4605, pp. 9-17; July 1 1983.

Keywords: human; carbon monoxide; radon; formaldehyde; asbestos; passive smoking; allergy; policy overview

Abstract:

Although official efforts to control air pollution have traditionally focused on outdoor air, it is now apparent that elevated contaminant concentrations are common inside some private and public buildings. Concerns about potential public health problems due to indoor air pollution are based on evidence that urban residents typically spend more than 90 percent of their time indoors, concentrations of some contaminants are higher indoors than outdoors, and for some pollutants personal exposures are not characterized adequately by outdoor measurements. Among the more important indoor contaminants associated with health or irritation effects are passive tobacco smoke, radon decay products, carbon monoxide, nitrogen dioxide, formaldehyde, asbestos fibres, microorganisms, and aeroallergens. Efforts to assess health risks associated with indoor air pollution are limited by insufficient information about the number of people exposed, the pattern and severity of exposures, and the health consequences of exposures. An overall strategy should be developed to investigate indoor exposures, health effects, control options, and public policy alternatives.

Spitzer, Walter O. (1984). "A Study of the Health Status of Residents of the Junction Triangle,". Dept. of Public Health, City of Toronto; September 1984.

Keywords: air pollution; research study; health effects; Junction Triangle; epidemiologic study; health status

Abstract:

The purpose of the study was to determine whether the residents of the highly industrialized Toronto Junction Triangle experience adverse health effects more frequently than do residents of a demographically similar but minimally exposed (non-industrialized) area of the City of Toronto, and/or residents of areas adjacent to the Junction Triangle. A comprehensive questionnaire was administered to 110 children and 290 adults in each of the Junction Triangle, the combined neighbourhoods adjacent to the Triangle, and the comparison tract. The author concludes that there is no difference in the health status of the adult residents of the Junction Triangle and those of the most comparable census tract of Toronto who were not exposed to the emanations from industry identified as being a problem in the Junction Triangle area. However, the study confirmed that the residents of the area experience markedly greater discomfort than people living in other areas of the city and the report recommends that industry guidelines should be established to "sharply reduce imposed factors that diminish the quality of life". It was also concluded that there is enough evidence of unfavourable health experience among children in the Junction Triangle area to warrant in depth, all-inclusive clinical evaluation of their health status.

Steensberg, Jens (1984). "Indoor Climate Problems in Institutions for Children - Practical, Administrative and Policy Perspectives". Indoor Air, Vol. 1, pp. 179-180; Swedish Council for Building Research, Stockholm Sweden, 1984.

Keywords: indoor air quality; children; schools; policy

Abstract:

On the basis of practical indoor climate problems in institutions for children, the study illustrates the administrative and policy perspectives of the decision making process, and some conclusions are attempted on possible ways of improving environmental health decision making. Examples of practical indoor climate problems in institutions for children are given. There are tentative answers to the following questions: How important are value attitudes versus scientific knowledge? Are existing regulations sufficient? How do local and central administrators handle indoor climate problems? Do the responsible politicians influence the course of events? What is the role of the press? Is the pressure from interest groups decisive?

Steffens, Heidi (1984). "Warning: Is Your School Safe?". NEA Today, pp. 4-5; National Education Association; November 1984.

Keywords: occupational health; indoor air pollution; schools; ventilation; safety;

Abstract:

Unseen toxic hazards inhabit school buildings, with asbestos being the tip of the iceberg. Toxic hazards can be found in art rooms, science labs, vocational shops, with art classrooms possibly the most dangerous. Art supplies, including those designed for young children, contain substances that can cause cancer or damage to the reproductive, nervous, and respiratory systems, the heart, and other vital organs. The many energy-efficient, air-tight school buildings constructed during the past decade create another set of problems due to lack of ventilation and access to outside air. These toxic hazards pose two types of health risks. An acute exposure will result in immediate and visible symptoms. The more insidious danger is from chronic exposure.

Steiner, J.; Flynn, N.W.; Wolbach, C.D. (1980). "Disposal of Polychlorinated Biphenyls (PCBs) and PCB-Contaminated Materials." Electric Power Research Institute, Water Quality Control and Heat Rejection Program, Coal Combustion Systems Division, Palo Alta CA; September 1980.

Keywords: PCB incineration; air pollution; electrical waste

Abstract:

This report presents the results of a trial burn conducted at the Energy Systems Company in El Dorado AK. It contains a brief overview of published literature on PCB incineration, a description of the ENSCO facility, a detailed discussion of the sampling and analysis procedures and a summary of the results obtained from the trial burn. In the trial burn, PCBs were not detected in the stack effluent, the scrubber liquor effluent or the recycled scrubber liquor from the sludge lagoon. PCBs were detected in the ash effluent from the rotary kiln and were less than 50 ppm, the lower limit at which PCBs are regulated by the EPA.

Stephens, R. (1981). "Human Exposure to Lead from Motor Vehicle Emissions". Intern. J. Environmental Studies, Vol. 17, pp.73-83; 1981.

Keywords: lead; automobile exhaust; emissions; children

Abstract:

A strictly quantitative assessment of the contribution made by car exhaust-gas lead to the body lead burdens of young children will probably never be attained. However, there is now available a substantial scientific literature relating airborne lead to lead in humans, especially in young children who ingest deposited and impacted aerosol lead on both food and non-food items. It is clear from blood lead surveys that pre-school children absorb more lead than other sections of the community because young children have a relatively higher metabolic rate and ventilation at rest. The distributions of lead burdens reported for newborn and pre-school children have been set against levels of lead absorption recently associated with pregnancy problems in women and impaired cognitive/behavioural functioning in children. A study by Needleman et al. in Boston Massachusetts of 158 seven and a half year old children shows that high lead children (greater than 6 ppm) performed significantly less well on a range of IQ tests and behaviour al ratings than low lead children.

Sterling, T.D.; Dimich, H.; Kobayashi, D. (1982). "Indoor Byproduct Levels of Tobacco Smoke - A Critical Review of the Literature". J. Air Pollut. Control Assoc., Vol. 32, No. 3, pp. 250-259; 1982.

Keywords: indoor air pollution; tobacco smoke;

Abstract:

The authors carry out a critical review of research findings relating to the byproduct levels of tobacco smoke. They point out serious methodological problems with some studies, but conclude that the presently available data are useful for gaining a reasonably accurate perspective of the amount of combustion products contributed by cigarette smoking under different conditions.

Sterling, T.D.; Sterling, E.; Dimich-Ward, H. (1983). "Building Illness in the White-collar Workplace". Simon Fraser University, Faculty of Interdisciplinary Studies, Burnaby Canada. Int. J. Health Serv., Vol. 13, No. 2, pp. 277-287; 1983.

Keywords: building illness; workplace; office; pollution; air-tight buildings;

Abstract:

The authors describe an increasing incidence of "building illness" among white-collar workers due to the high pollutant content of air in modern energy-efficient office buildings. These buildings are hermetically sealed, mechanically ventilated, and contain many materials that give off a variety of toxic fumes and aerosols. Severe outbreaks of illness have also been traced to ventilation problems in sealed hospital buildings.

Stewart, Richard D.; and Hake, Carl L. (1976). "Paint-Remover Hazard". JAMA, Vol. 235, No. 4, Jan. 26, 1976. Reprint requests to Dr. R. Stewart, Medical College of Wisconsin, Allen-Bradley Medical Science Laboratory, 8700 W. Wisconsin Ave., Milwaukee, WI, USA 53226.

Keywords: paint remover, methylene chloride, carbon monoxide, carboxyhemoglobin; cardiovascular stress;

Abstract:

The in-home use of paint removers containing methylene chloride results in the absorption of this solvent, which is metabolized to carbon monoxide. Exposure for two to three hours can result in the elevation of carboxyhemoglobin (COHb) to levels that stress the cardiovascular system. The metabolic formation of COHb continues following the paint-remover exposure, doubling the duration of the cardiovascular stress produced by a comparable COHb level after exposure to CO. Patients with diseased cardiovascular systems may not be able to tolerate this unexpected stress.

Stewart, Richard D.; Peterson, Jack E.; Baretta, Edward D.; Bachand, Romeo T.; Hosko, Michael J.; Herrmann, Anthony A. (1970). "Experimental Human Exposure to Carbon Monoxide". Arch Environ Health, Vol. 21, pp. 154-164; August, 1970.

Keywords: CO; carbon monoxide; health effects; behaviour; learning

Abstract:

Human volunteers were exposed to carbon monoxide at concentrations of less than 1, 25, 50, 100, 200, 500 and 1,000 ppm for periods of one-half to 24 hours. No untoward effects were observed in sedentary males exposed to 100 ppm for eight hours. Exposures producing carboxyhemoglobin saturations greater than 15% to 20% resulted in delayed headaches, changes in the visual evoked response and impairment of manual coordination.

Strickland, Bonnie R. (1982). "Implications of Food and Chemical Susceptibilities for Clinical Psychology". International Journal of Biosocial Research, Vol.3, No. 1, pp. 39-43; 1982

Keywords: chemical susceptibility; behaviour; children; treatment; assessment; food sensitivity;

Abstract:

Many problems result when the clinician attempts to understand the role of food and chemical substances in behaviour problems. The enormous range of individual differences, public misconceptions, lack of research, and the problem of applying old approaches to new situations, all affect how the clinician relates to patients. The public and professionals must become educated as to primary prevention. Clinicians must broaden their repertoire of assessment and treatment techniques.

Suess, Michael J. (1984). "Exposure and Health Effects of Indoor Air Pollution". Clinical Ecology, Vol 11, No. 3, pp. 130-136; Summer 1984.

Keywords: indoor pollution; ventilation rates; smoking; radon; insulation; aircraft; trains; cars; buses; chemical additives; exposure-response relationships;

Abstract:

Increased concern about indoor air pollution has led to increased effort to determine its sources and how to prevent it. Indoor pollutants may be generated outdoors as well as indoors through a variety of mechanisms. Vehicles and transportation terminals present special problems as do public buildings and medical facilities. More indoor pollution data is needed before adequate assessments of indoor pollution can be made.

Sugita, Kido; Ogihara, Arata; Murabayashi, Hiroshi; Ichikawa, Sehchi; Shishido, Masao (1981). "The Relationship of Air Pollution and Respiratory Function and Bacterioflora in Pharyngeal Mucus on Junior High School Students". Yokohama Med. Bull., Vol. 32, No. 3-6, pp. 215-225; 1981.

Keywords: air pollution; respiratory function; health effects; children

Abstract:

The studies were performed to investigate the effect of multiple air pollutants on the human body. Examination of respiratory function was made by means of the flow-volume curve method and the bacterioflora in pharyngeal mucus was examined. Students from three junior high schools located in a polluted area, a less-polluted area, and a non-polluted area, were tested and the results were compared. The results obtained were as follows: comparing maximal expiratory flow rate in summer, fall and winter, it was highest in summer; measures of central-airway respiratory function were the lowest at the school in the most polluted area; streptococci occurrence was high in winter and gram negative bacilli occurrence was high in summer; gram negative bacilli were the lowest at the school in the non-polluted area.

Sullivan, John L.. "Office Air Contaminants and Their Sources". University of Western Ontario, Occupational Health & Safety Resource Centre.

Keywords: indoor air pollution; offices; occupational health

Abstract:

Several studies of buildings have been conducted as a result of complaints about air quality. The increased importance of building ventilation due to recent sealing of buildings for energy conservation is highlighted. Typical sources of indoor air pollutants are described. These include sulphur oxides, ozone, pollens, lead, chlorine, nitrogen dioxide, carbon monoxide and dioxide, particles, radon, formaldehyde, asbestos, synthetic fibres, polycyclic hydrocarbons, ammonia, mercury, aerosols and allergens.

Suzuki, David (1985). "Demand for Absolute Proof is Polluter's Cop-Out Excuse". Toronto Star, Mar 2, 1985.

Keywords: pollution; PCBs; Pottersburg Creek; radiation; asbestos; dioxin; lead; denial; responsibility;

Abstract:

Dr. David Suzuki notes that in cases of environmental pollution the initial reaction of authorities and potential culprits is denial: denial of possible effects and denial of responsibility. He is astounded that there is not an immediate concern for the health of the people affected.

Tager, Ira B.; Weiss, Scott T.; Rosner, Bernard; Speizer, Frank E. (1979). "Effect of Parental Cigarette Smoking on the Pulmonary Function of Children". American Journal of Epidemiology, Vol. 110, No. 1, pp. 15-26; 1979.

Keywords: respiratory tract infections; cigarette smoking; children

Abstract:

The authors have investigated the effects of parental smoking patterns on the pulmonary function of children in East Boston, Massachusetts. A crude inverse dose-response relationship was observed between the level of FEF 25-75 % (forced expiratory flow 25-75 per cent of forced vital capacity per cent) predicted of children who never smoked and the number of smoking parents in the household. Compared to children with two non-smoking parents, the level of FEF 25-75 % predicted was 0.156 and 0.355 standard deviation units lower for children with one and two currently smoking parents, respectively. An additional decline in level of FEF 25-75 % predicted was observed for children who themselves had smoked. Smoking children with two smoking parents had an average FEF 25-75 % predicted level which was 0.355 standard deviation units lower than non-smoking children with two smoking parents. These data not only confirm that cigarette smoking by young children and teenagers has direct measurable effects on their pulmonary function, but also show that cigarette smoking by parents has a measurable effect on the pulmonary function of their children which is independent of any direct use of cigarettes by the children.

Thatcher, R.W.; Lester, M.L.; McAlaster, R.; Horst, R. (1982). "Effects of Low Levels of Cadmium and Lead on Cognitive Functioning in Children". Archives of Environmental Health, Vol. 37, No. 3, pp. 159-166; May/June 1982.

Keywords: cadmium; lead; hair analysis; intelligence tests; school achievement; school; children; air pollution; Maryland

Abstract:

Hair cadmium and lead content were related to intelligence tests, motor impairment assessments, and school achievement scores from 149 children aged 5 to 16 enrolled in rural Maryland public school systems. Hair cadmium and lead were significantly correlated with both intelligence scores and school achievement scores, but not motor impairment scores. Significant relationships with IQ were obtained after regressing out demographic factors and were observed even in children within a normal IQ range. Evidence of different effects of cadmium and lead on cognitive development was obtained. Hierarchical regression analyses suggest that cadmium has a significantly stronger effect on verbal IQ than does lead and that lead has a stronger effect on performance IQ than does cadmium.

Thielebeule, U.; Pelech, L.; Grosser, P-J.; Horn, K. (1980). "Height and Bone Age of School Children in Areas of Different Concentrations of Air Pollution: A Repeat Study Conducted in Bitterfeld and Berlin, East Germany". Zeitschrift Fuer Die Gesamte Hygiene Und Ihre Grenzgebiete; Vol. 26, No. 10; pp. 771-774; 1980.

Keywords: air pollution; height; bone age; children

Abstract:

An examination of the height and bone age of school children living in areas of different concentrations of air pollution in comparison with their calendar age was performed and repeated ten years later. There was a substantial drop in dust emission in the highly polluted area of Bitterfeld in the period between the first and repeat examination thanks to considerable investments in the field of energy economy. This was accompanied by a more favourable development of the height and bone age of children living in Bitterfeld than in the preceding period and they are now closer to those of children living in Berlin. It is assumed that these improvements are connected with improvements in the environmental conditions.

Thornton, Jimmy. "CalPIRG Cites Toxins In School Art Supplies". The Tribune, San Diego CA

Keywords: art supplies; toxic substances; California; schools; product labelling; health hazards

Abstract:

Art supplies being used in many California public school systems contain toxic substances that pose potential health and safety hazards, according to a report released by a division of the California Public Interest Research Group (CalPIRG). Two bills are before the state governor that would require that school art supplies be labelled as to content and that those supplies considered hazardous be kept out of the hands of kindergarten and elementary pupils.

Toronto Board of Education (1981). "Business Administration Committee Agenda, Monday, November 2, 1981". Administrative Services Dept., Board of Education for the City of Toronto, 155 College St., Toronto M5T 1P6.

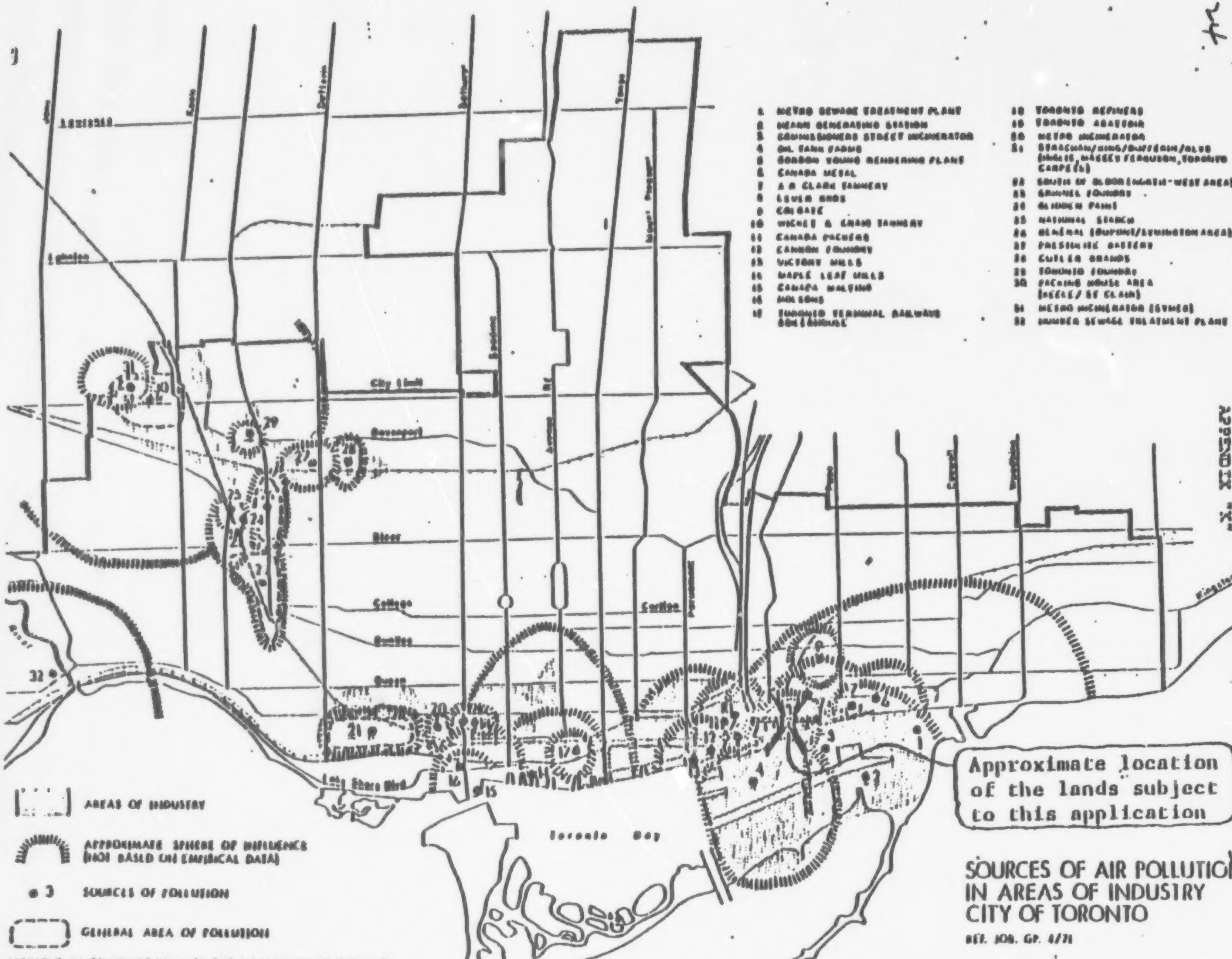
Keywords: pollution map; City of Toronto; official plan amendments; industrial emissions; map;

Abstract:

This Business Administration Committee Agenda contains a report from Board staff on proposed official plan amendments. Included in the report is a map "Appendix K" showing the areas of heaviest pollution within the City of Toronto, extracted from a City of Toronto Planning Board Report dated February 26, 1974. Background data describing the sources of pollution are from the revised version of the same Planning Board report, dated March 12, 1974. To date (May, 1985), the Toronto Board of Education has not received any updates from the City of the 1971 pollution map. The map is reproduced on the following page.

24.

APPENDIX "X"


1 METRO SEWAGE TREATMENT PLANT
2 HEARN GENERATING STATION
3 COMMISSIONERS STREET INCINERATOR
4 OIL TANK FARMS
5 GORDON YOUNG RENDERING PLANT
6 CANADA METAL
7 A R CLARK TANNERY
8 LEVER BROS
9 COLGATE
10 WICKETT & CRAIG TANNERY
11 CANADA PACKERS
12 CANNON FOUNDRY
13 VICTORY MILLS
14 MAPLE LEAF MILLS
15 CANADA MALTING
16 MOLSONS
17 TORONTO TERMINAL RAILWAYS ROUNDHOUSE
18 TORONTO REFINERS
19 TORONTO ABATTOIR
20 METRO INCINERATOR
21 STRACHAN/KING/DUFFERIN/OLIVE (INGLIS, MASSEY FERGUSON, TORONTO CARPETS)
22 SOUTH OF BLOOR (NORTH-WEST AREA)
23 GRANVILLE FOUNDRY
24 GLIDDEN PAINT
25 NATIONAL STARCH
26 GENERAL (DUPONT/SYMINGTON AREA)
27 PRESTOLITE BATTERY
28 CUTLER BRANDS
29 TORONTO FOUNDRY
30 PACKING HOUSE AREA (KEELE/ST CLAIR)
31 METRO INCINERATOR (SYMES)
32 HUMBER SEWAGE TREATMENT PLANT
AREAS OF INDUSTRY
APPROXIMATE SPHERE OF INFLUENCE (NOT BASED ON EMPIRICAL DATA)
3 SOURCES OF POLLUTION
GENERAL AREA OF POLLUTION
Eglinton
City Limit
Davenport
Bloor
College
Dundas
Queen
Lake Shore Blvd
Toronto Bay
Kingston
Keele
Dufferin
Bathurst
Yonge
Spadina
Parliament
Approximate location of the lands subject to this application

SOURCES OF AIR POLLUTION
IN AREAS OF INDUSTRY
CITY OF TORONTO

REF. JOB. GP. 4/71

PREPARED IN CONJUNCTION WITH THE AIR MANAGEMENT BRANCH, MINISTRY OF THE ENVIRONMENT (SEE RELATED TABLE ON INDIVIDUAL EMISSIONS) DEC. 1974

Toronto Board of Education (1982). "Chemical Data Sheets". The Board of Education for the City of Toronto, Toronto, Canada. T.M. Dorward, Occupational Health and Safety Officer. Three-volume manual.

Keywords: chemicals; indoor air pollution; hazards; occupational safety products;

Abstract:

This manual contains an alphabetical collection of looseleaf User Information Sheets. Each page contains information relevant to one particular chemical substance, identifying the chemical composition of each brand name product used or stored in the city's schools. Also included is information on potential hazards, handling and emergency procedures for many of the products.

Toronto Board of Education, (1985). "Board Meeting, Wednesday, May 1, 1985, Amendments to Committee Reports". Administrative Services Dept., Board of Education for the City of Toronto, 155 College St., M5T 1P6.

Keywords: railway lands; Urban Development Report;

Abstract:

Report #5 of the Business Administration Committee, April 19, 1985, Item #9 discusses the City of Toronto's Urban Development Report 1985-4 "Redevelopment of the Railway Lands". The Committee reviewed the report in detail and presented a number of detailed recommendations for the response of the Board of Education to the City of Toronto. Recommendation C notes that it appears to the Board that environmental issues have been understated, raising concern at the Board about the resulting likelihood of a retention of less than desirable living conditions for school age children even into the future. The Board adopted the committee's recommendations with changes as noted in the May 1, 1985 Minutes.

Toronto Board of Health (1985). "Motion to the Toronto Board of Health on Behalf of the Pollution and Education Review Group of the Board of Education for the City of Toronto by Trustee Fiona Nelson, March 19, 1985, Regarding the Junction Triangle Followup Health Study". For Reprints Enquire Toronto Board of Health, City Hall, Toronto. (See also pp. 72,73 of this report.)

Keywords:Junction Triangle; chemical susceptibility; medical treatment; volatile organics; blood tests; environmental medicine;

Abstract:

The Board of Education urged the Toronto Board of Health to make greater use of the technology and expertise available in the field of environmental medicine in the followup studies on the health of children in the Junction Triangle.

Toronto Dept. of Public Health (1984a). "Junction Triangle Health Assessment Program". City of Toronto Department of Public Health, City Hall, Toronto; September 1984.

Keywords: health survey; promotion programme; children; air pollution; Toronto Spitzer Report;

Abstract:

This is a description of the design recommended for the comprehensive health promotion programme recommended by Dr. W.O. Spitzer in his May 1984 Junction Triangle epidemiological study report. Included are a cross-section of the study, further assessments of health in the Junction Triangle, lists of resources and costs, and a discussion of the tests being recommended for the programme along with the reasons for their acceptance or rejection.

Toronto Dept. of Public Health (1984b). "Junction Triangle Health Assessment Program Addendum". City of Toronto Department of Public Health, City Hall, Toronto Canada; Oct. 24, 1984.

Keywords: Junction Triangle; air pollution; health effects; study; Toronto

Abstract:

Populations have been assigned priorities based on degree of exposure to the Junction Triangle environment and evidence for health effects provided by the reanalysis of data from the Spitzer study. Children aged 6 to 14 years who live and attend school in the Junction Triangle are first priority.

Toronto Dept. of Public Health (1985). "Health Check". Brochure, approx. February 1985. Inquire City of Toronto Dept. of Public Health, City Hall, Toronto.

Keywords: Junction Triangle; children; health problems; industrial pollution; hearing screen; ear examination; skin; nasal cytology; breathing;

Abstract:

This brochure answers questions about the Board of Health's followup study on the health of children in the Junction Triangle area. Instructions are given to parents regarding health interviews. The brochure invites parents or guardians to call 532-4431 for further information. A map of the Junction Triangle area is included on the front of the brochure, showing the area bounded by the Canadian Pacific Railway line on the north (north of Dupont Street), Canadian National Railway lines on the east and west, and Bloor Street on the south.

Toronto Star (1984). "Pregnant Women, Kids to be Tested for Lead". The Toronto Star. 1984.

Keywords: lead; Toronto; testing

Abstract:

Toronto's Medical Officer of Health has ordered door-to-door lead level testing for children and pregnant women living near the Toronto Refiners and Smelters Ltd. plant.

Toronto Star (February 10, 1984). "West End Has High Rate of Birth Defects Compared to East Health Study Shows." Toronto Star, February 10, 1984.

Keywords: birth defects; Toronto west end; Toronto east end

Abstract:

This article reports on a City of Toronto health department study which shows that major birth defects occur three times as often in the city's west end as they do in the rest of the city. The study does not suggest a cause for the birth defects. The report recommends further statistical study to find out the role played by parents' ethnic background, age and diet in causing birth defects. Inquire Dept. of Public Health, City Hall.

Toronto Star (December 1984). "Workers Fume as Winnipeg Firm Outlaws Smoking". Toronto Star, p. D2; December 1984.

Keywords: tobacco smoke; occupational health; indoor air pollution

Abstract:

A Boeing of Canada Ltd. plant in Winnipeg has banned smoking in the workplace, claiming smoking costs too much in lost production time and in damage to the health of the workers. About 60% of the staff are smokers. The scheme was announced after the parent company in Seattle, Washington launched a similar plan.

Toronto Star (March 27, 1985). "'20th Century Disease' Kids Get Separate Special Class".

Keywords: twentieth century disease; Kitchener; Waterloo County Board of Education; hypersensitivity; low-pollution classroom;

Abstract:

This newspaper article describes action taken by principal Harry McCosh of Kitchener Collegiate Institute in Kitchener, Ontario, to provide a special low-pollution classroom in this secondary school, for use by students who are hypersensitive to low levels of indoor air pollutants.

Toronto Star (May 3, 1985). "Preservatives in Lumber may be Health Risk". Toronto Star, May 3, 1985, p. A19.

Keywords: preservatives; wood; lumber; toxic; dioxin; arsenic; creosote; pentachlorophenol; cancer

Abstract:

This article describes an interview with Dieter Riedel, a federal toxicologist, concerning the hazards of wood preservatives. Dr. Riedel is reported to have said that there are reasonable grounds to think there is a problem for people who handle such preservatives at work. It is uncertain whether they are a potential hazard when used at home. The hazardous chemicals of concern include dioxins and arsenic, found in the three main wood preservatives - creosote, pentachlorophenol, and arsenic compounds. Creosote is a coal tar distillate containing hundreds of chemicals, including some carcinogens. Pentachlorophenol is being withdrawn from use because of toxic impurities. Arsenic compounds, contained in treated lumber with a green colour, are linked to lung cancer.

Tosteson, Tor D.; Spengler, John D.; Weker, Robert A. (1982). "Aluminum, Iron, and Lead Concentrations of Personal, Indoor, and Outdoor Respirable Particles". Environment International, Vol. 8, No. 1/6; 1982; Pergamon Press, Oxford, Toronto; 1982.

Keywords: air pollution - analysis; personal monitoring study in Topeka, Kansas; sampling protocol; instrumentation; concentrations; significantly different; outdoor respirable particulate mass; correlation with personal or indoor metal concentrations; motor vehicles; indicator of lead exposure; aluminum

Abstract:

Samples of respirable particulate matter collected during a personal monitoring study in Topeka, KA, were analyzed for iron, aluminum and lead content. The sampling protocol and instrumentation are described in detail. Lead indoor concentrations (median = 79ng/m^3) were found to be less than both personal (median = 112ng/m^3) and outdoor lead concentrations (median = 106ng/m^3). The indoor, outdoor, and personal levels of iron and aluminum were not significantly different. In addition, it was determined that outdoor respirable particulate mass does not correlate well with the personal or indoor metal concentrations, and that the amount of time spent in motor vehicles is a relatively good indicator of lead exposures. The relationships between indoor, outdoor, and personal lead are discussed in greater detail, with references to supporting evidence from other studies.

Travis, Nick; Holladay, Ruth (1981). "The Body Wrecker". Don Quixote Publishing Co., Texas; 1981.

Keywords: clinical ecology; chemical sensitivity; pollution; health hazards

Abstract:

An introduction to clinical ecology; includes many case histories and anecdotal descriptions from clinical ecologists who have observed allergic reactions affecting the central nervous system, including personality changes, mood swings, depression, irritability, poor concentration and memory, hyperactivity, nervousness, and learning disorders. There are suggestions for recognizing such reactions as well as for improving the indoor environment and lowering a susceptible individual's body load of chemicals.

US Govt. (1982). "Asbestos-containing Materials in School Buildings: A Guidance Document. Part 1". Govt Reports Announcements & Index, Issue 21; 1982.

Keywords: asbestos; schools

US Govt. (1969). "Effects of Chronic Exposure to Low Levels of Carbon Monoxide on Human Health, Behavior and Performance". US Govt.; 1969.

Keywords: performance - human; health; environments; physiological effects; exposure; metabolism; public health; bibliographies; air pollution effects - humans; carboxyhemoglobin; behaviour;

Abstract:

This is an assessment of the state of knowledge concerning the effects on human health of carbon monoxide, one of the major atmospheric pollutants. Presented are well established observations on effects of low levels of CO encountered on urban streets and in traffic tunnels. Research is recommended to broaden present knowledge of physiology and biochemistry of CO toxicity.

Ulsamer, A.G.; Gupta, K.C.; Cohn, M.S.; Preuss, P.W. (1982). "Formaldehyde in Indoor Air: Toxicity and Risk". Air Pollution Control Association; June 1982.

Keywords: formaldehyde; indoor air pollution; health hazards; teratogenic; genetic; carcinogenic

Abstract:

The Consumer Product Safety Commission has received over 3,000 complaints involving consumer exposure to formaldehyde vapour released from building materials. Indoor levels of formaldehyde may range from less than 0.01 to approximately 3 ppm. The effects of formaldehyde on human health derive in part from its properties as a strong irritant and sensitizer. Exposure to formaldehyde can produce a variety of symptoms depending on the mode, duration, and concentration of exposure. They range from statistically significant irritant responses of the eye, nose and throat to prolonged eye, nose and throat irritation, coughing, wheezing, diarrhea, nausea, vomiting, headaches, dizziness, lethargy, irritability, disturbed sleep, olfactory fatigue, and skin irritation. It has been demonstrated to be mutagenic in bacteria, fungi, insects, and mouse lymphoma cells. Of additional concern is the carcinogenic potential of formaldehyde in humans.

University of Toronto (1984). "Office Air Pollution". University of Toronto Staff Association Newsletter, Vol. XIV, No. VI, pp. 9-10; October 1984.

Keywords: indoor air pollution; office pollution; ventilation; health hazards

Abstract:

Experts in occupational medicine have identified, as possible health effects created by office pollutants, conditions ranging from headaches and nausea, and respiratory tract and eye irritation to cancer and genetic damage. Such effects have been exacerbated by the advent of air-tight buildings, constructed with energy conservation in mind, which recirculate contaminants many times throughout a building. Studies at the Lawrence Berkeley Lab at the University of California strongly suggest that the synergistic effect among the large numbers of trace organics may be the key to so-called tight building syndrome.

Utidjian, Michael D. (1979). "Panel Discussion: Role of High Risk Groups in Standard Derivation". Equitable Environmental Health, Inc. Environmental Health Perspectives, Vol. 29, pp. 161-173; 1979.

Keywords: risk groups; hypersusceptibility; standards;

Valciukas, Jose A.; Lilis, Ruth (1980). "Psychometric Techniques in Environmental Research". Environmental Research, Vol. 21, pp. 275-297; Academic Press Inc.; 1980.

Keywords: behaviour; neurotoxicity; environmental agents; air pollution

Abstract:

Behavioural changes may be the earliest and only manifestation of neurotoxicity. Moreover, it is well known that extensive brain damage can occur with little or nondetectable clinical neurological deficit. Psychometric techniques now in use in toxicological and epidemiological research have been proposed to assess in an objective manner early manifestations of functional neurological changes that may be due to environmental neurotoxic agents.

Valciukas, Jose A.; Lilis, Ruth; Fischbein, Alf; Selikoff, I.J.; Eisinger, Josef; Blumberg, William E. (1978). "Central Nervous System Dysfunction Due to Lead Exposure". Science, Vol. 201, pp. 465-467; August 1978.

Keywords: lead; health hazards; central nervous system

Abstract:

Central nervous system dysfunction was investigated in workers at a secondary lead smelter by means of peformance tests. Correlations between test scores and zinc protoporphyrin levels, a biological indicator of lead toxicity, are statistically significant. This correlation should prove to be useful in current efforts to evaluate effects of lead exposure.

Van Loon, Jon C. (1984) "A Study of the Relationship of Trace Elements to Neurological Dysfunctions Related to Learning Disabilities". Ontario Association for Children With Learning Disabilities, 1901 Yonge St, suite 504, Toronto Canada M4S 2Z3.

Keywords: learning disabilities; nutrition; education; Association for Children With Learning Disabilities

Abstract:

This is a proposal to collect and evaluate the available literature on the role of trace elements in neurological dysfunctions relating to learning disabilities. The Association is seeking funding for the study.

Van Rensburg, J.P.; Van Der Walt, W.H.; Van Der Linde, A.; Kielblock, A.J.; Strydom, N.B. (1982). "Lead Absorption in Distance Runners Exposed to Motor Vehicle Exhaust Fumes". S.A. Journal for Research in Sport, Physical Education and Recreation, Vol. 5, No. 1, pp. 21-44; 1982.

Keywords: lead; automobile exhaust; health effects; air pollution

Abstract:

In order to establish the extent to which lead in exhaust fumes of motor vehicles is absorbed by athletes training along motorways, blood and urine samples of 94 distance runners from various regions in Johannesburg were analysed for lead and its derivatives. These results were compared with those obtained from a sedentary control group (n=122) and a group occupationally exposed to high levels of atmospheric lead (n=84). The above analyses were extended to erythrocyte count, haematocrit, haemoglobin and mean cell volume with regard to the runners and the sedentary control group. The mean whole blood level concentration of the distance runners was significantly elevated above that pertaining to the control group. In the absence of any irregularities in the haemopoietic pattern, it is suggested that these elevations do not constitute a short-term health hazard. In contrast, the industrial reference group exhibited significantly higher levels for all parameters. The overall impression is, therefore, that the airborne lead levels to which runners are exposed are not high enough to elicit any adverse biological effects. However, the fact that significantly higher whole blood lead levels were found in the runners, points to an "above average" exposure. The long-term or chronic effects of these "above average" levels are not known.

Visual Arts Ontario (1981). "The State of the Art: Health Hazards, Conservation and New Materials For the Visual Artist". Visual Arts Ontario; November 1981.

Keywords: art supplies; health hazards; indoor air pollution

Abstract:

The objective of the conference is to make known the hazardous effects certain commonly used art supplies can have and the precautions that should be exercised. Artists are among the highest sufferers of cancer, among other diseases due to use of solvents, heavy metals, mineral dusts, gases, and other hazardous chemicals such as acids and alkalis. Adequate ventilation, proper use of protective equipment and basic safety equipment must become the concerns of art educators. Elementary, secondary and post secondary institutions must incorporate into their curriculum, health and safety programmes regarding the use of art materials.

Vogt, R.L.; Witherell, L.; Larue, D.; Klaucke, D.N. (1982). "Acute Fluoride Poisoning Associated with an On-site Fluoridator in a Vermont USA Elementary School". American Journal of Public Health, Vol. 72, No. 10, pp. 1168-1169; 1982.

Keywords: fluoride; health effects; pollution

Abstract:

On August 30, 1980, an outbreak of minor illnesses consisting of nausea and vomiting affected 22 individuals attending a farmers' market at a school. Illness was associated with the consumption of beverages made from school water. Analysis of the water showed high levels of fluoride (1,041 mg/l). The most likely source of the contamination was the school fluoridator, which had accidentally been left on continuous operation.

Voronova, B.Z.; Elkovskaya, E.A. (1980). "Effect of the Ventilation Regime on the Functional State of Young Schoolchildren". Gigiena I Sanitariya, No. 6, pp. 31-35; 1980.

Keywords: ventilation; air supply; children

Abstract:

In model experiments, an appreciable improvement in air quality occurred when the rate of air supply was increased to 40 or more cubic meters per hour per child, whereas the functional state of the children improved only when the air supply was increased to at least 60 cubic meters per hour per child. The functioning of different bodily systems did not improve simultaneously. The first to improve were the respiratory and cardiovascular functions, followed by that of the central nervous system.

Wadden, Richard A.; Scheff, Peter A. (1983). "Indoor Air Pollution: Characterization, Prediction, and Control". University of Illinois, School of Public Health, Environmental and Occupational Health Sciences, Chicago IL. John Wiley & Sons, Inc., Box 63, Somerset NJ 08873; Environmental Science and Technology Series, ISBN 0-471-87673-9. Used as a basis for APCA Course 850-1 "Characterization, Prediction and Control of Indoor Air Pollution", April 27/28, 1985, Ottawa, Ontario, in connection with the APCA International Specialty Conference on Indoor Air Quality in Cold Climates: Hazards and Abatement Measures, Holiday Inn, Ottawa, Canada, April 28-May 1, 1985.

Keywords: indoor air pollution; quantitative analysis; tobacco smoke; formaldehyde; pitfalls to avoid; standards

Abstract: This text is organized into four parts: characterization, prediction, control, and application. The health implications, external and internal contributions, and the measurement of indoor air pollution are described. The current status of prediction techniques is outlined, including areas such as one-compartment models, infiltration estimation, and empirical models. The most common control methods are summarized - filters, electronic air cleaners, gas filters and traps. Finally, the application of modelling techniques to several typical indoor settings is examined in detail.

In a course run by the authors in Ottawa in late April, 1985, and for which this publication served as a textbook, Messrs. Wadden and Scheff suggested that the samples of "Occupational Standards" which are discussed around Table 1.3 on page 5 of this publication are approximately ten times too high for an application to buildings to be used by a general cross-section of the population, while Table 7.1 on page 136 (ASHRAE) would lead to acceptable standards. The range of chemicals, covered by "Occupational Standards", however, is very extensive. The authors therefore suggest that where no established ASHRAE standards exist, use should be made of the occupational standards, but divided by a factor of ten.

The Toronto Board of Education's Planner-Demographer has suggested in turn that the ASHRAE standard might be divided by ten to produce a "[illegible] safe" standard, but this may be difficult to achieve in practice. Despite practical difficulties, however, it may be necessary to restrict the levels of known sensitizing chemicals to a small fraction of the occupational or ASHRAE standards (e.g. 1/100 or 1/1000).

Wadden, Richard A.; Scheff, Peter A. (1985). "Estimation of Activated Carbon Requirements for Controlling Air Quality in an Art Workshop". Chapter 12 (Supplemental) to "Indoor Air Pollution: Characterization, Prediction, and Control" (John Wiley & Sons, Inc., Box 63, Somerset NJ USA 08873; 1983). Enquire University of Illinois, School of Public Health, Environmental and Occupational Health Sciences, Chicago IL USA. This chapter was distributed to participants in APCA Course 850-1 "Characterization, Prediction and Control of Indoor Air Pollution", April 27/28, 1985, Ottawa, Ontario, in connection with the APCA International Specialty Conference on Indoor Air Quality in Cold Climates: Hazards and Abatement Measures, Holiday Inn, Ottawa, Canada, April 28-May 1, 1985.

Keywords: indoor air pollution; quantitative analysis; activated carbon; art; workshops;

Abstract:

A variety of solvents and other potentially hazardous compounds are typically used in art workshops, including acetone, styrene, toluene, benzene, methyl cellulose acetate, xylene, and others. Methyl cellulose acetate (MCA) was chosen as a representative paint and printing solvent. The authors demonstrate how activated carbon requirements for reducing indoor solvent odours may be estimated for several different control efficiencies.

Wallace, James F.; Wallace, Maureen J. (1978.) "The Effects of Excessive Consumption of Refined Sugar on Learning Skills, Behavior Attitudes and/or Physical Condition in School-Aged Children". Parents For Better Nutrition, 33 N. Central, Room 200, Medford OR 97501; 1978.

Keywords: sugar consumption; health effects; children

Abstract:

The authors claim that refined sugar consumption is an accurate indicator of nutritional inadequacy. They say it is a gastrointestinal irritant causing all manner of stomachaches and problems in children. They find excessive refined sugar intake to be an important factor in behavioural problems, fatigue, learning deficiencies, hyperactivity, juvenile delinquency, violence, premature sexuality, skin problems, alcoholism, drug abuse and many diseases: diabetes, hypoglycemia, cardiovascular disease, obesity, tooth decay, arthritis and myopia.

Waterloo Public Interest Research Group (1979) "Public Informational Meeting on 2,4-D". Waterloo Public Interest Research Group, University of Waterloo, Ontario; 1979.

Keywords: phenoxy herbicides; schoolyards; 2,4-D; spraying; herbicides

Abstract:

A group of parents in Northumberland County became concerned about the spraying of their children's schoolyards with 2,4-D during school hours. They formed an organization and convinced a large number of school boards to discontinue spraying.

Wayne, Walborg S.; Wehrle, Paul F. (1969). "Oxidant Air Pollution and School Absenteeism". Arch. Environ. Health, Vol. 19, pp. 315-322; September 1969.

Keywords: respiratory illness; air pollution; photochemical smog

Abstract:

Absence rates attributed to respiratory illness were studied in relatonship to oxidant concentrations in two elementary school populations by school year, season, week, and day. The analysis revealed no evidence of statistically significant associations between absence rates and oxidant levels. The pattern of absence rates for respiratory symptoms was similar at both schools. Rates were highest in winter and usually greater on Monday and Friday than on other days. In contrast, oxidant levels were lowest in winter and usually higher in the middle of the week than on Monday and Friday. Substitution of standardized daily absence ratios for absence rates in the analysis of the day-of-the-week data in relationship to oxidant concentrations confirmed the basic results of the study. Presumably, "nonillness" phenomena had been minimized in the ratios, thus allowing absences actually due to illness to be studied in relationship to oxidant.

Weiss, Bernard (1983). "Behavioral Toxicology and Environmental Health Science". American Psychologist, pp. 1174-1187; American Psychological Association, Inc.; November 1983.

Keywords: behavioural toxicology; environmental health sciences; air pollution; food additives; environmental chemicals

Abstract:

Behavioural toxicology is now established as a component of the environmental health sciences. Its rise paralleled recognition that the adverse health impact of environmental chemicals should be gauged by how people feel and function, not solely by death or overt damage. Its compass extends across the total spectrum of environmental chemicals, including heavy metals, solvents, fuels, pesticides, air pollutants, and even food additives. Psychology can help resolve many critical issues in environmental health science and toxicology. Government agencies have to determine how to predict hazard to humans from animal testing, how to calculate risk on the basis of functional measures. Behavioural toxicologists must design adequate behavioural tests so that, for instance, behaviour will be included in food additive testing protocols.

Weiss, Bernard; Spyker, Joan M. (1974). "Behavioral Implications of Prenatal and Early Postnatal Exposure to Chemical Pollutants". Pediatrics, Vol. 53, No. 5, Part II, pp. 851-856; May 1974.

Keywords: behaviour; chemical pollutants; air pollution; health hazards; children;

Abstract:

Some health effects caused by long term exposure to small levels of chemical pollutants may be represented as a slow processs similar to natural aging. It is extremely difficult to evaluate whether such differences are significant biological changes and whether they represent a potential for significant functional differences. The brain possesses an enormous reserve capacity. Still, a process that reduces this reserve capacity may, at some time later in life, because of additional losses, make the brain incapable of coping with any additional loads. Subtle neurological deficits and behavioural impairments are common developments of early exposure to lead. These handicaps are often not recognized until the child enters school when he or she exhibits a short attention span, hyperirritability and aggressiveness, sensory and motor impairments. Conventional neurological examinations often fail to detect such instances of minimal brain dysfunction.

Wigle, D.T. (1982). "Tobacco Smoke and the Non-Smoker". Bureau of Epidemiology, Laboratory Centre for Disease Control, Health and Welfare Canada, Ottawa, Canada. Chronic Diseases in Canada, Volume 3, No. 1, June 1982, pp. 5-8.

Keywords: smoking; tobacco; respiratory disease; risk;

Abstract:

Some 37% of Canadian adults still smoke regularly. Any plan to reduce the extent of smoking must overcome at least two major obstacles. First, smoking is a powerful addiction with failure rates after cessation as high or higher than those for heroin addicts or alcoholics. Secondly, smoking is still socially acceptable (at the time of writing) or at least allowed in most areas. Thus, smokers do not receive enough negative feedback from non-smokers to have a major impact on the problem.

Wigle, Donald T.; Mao, Yang; and Grace, Michael (1980). "Relative Importance of Smoking as a Risk Factor for Selected Cancers". Health and Welfare Canada, Ottawa, Canada and Division of Community Health Science, University of Calgary, Calgary, Alberta. Canadian Journal of Public Health, Vol. 71, July/August 1980, pp. 269-275.

Keywords: tobacco smoke; cancer; risk; pharynx; larynx; lung; esophagus; bladder; lip; pancrease; kidney;

Abstract:

To estimate the proportion of smoking-related cancers that might be prevented if persons did not smoke, a case-control study was performed using questionnaire data gathered from 3924 persons in Alberta who had developed cancer during the period 1971 to 1973. The population attributable risk percent by cancer site among persons who had ever smoked any type of tobacco was: lip: 44% for males; tongue, mouth and pharynx: 84% for males, 37% for females; esophagus: 67% for males; larynx: 84% for males; trachea, bronchus and lung: 88% for males, 52% for females; and bladder: 58% for males, 39% for females.

Wilson, Jim (1983). "Indoor Air Quality". Environment Views, pp. 12-15; July/August 1983.

Keywords: indoor air pollution; offices; health effects; Geist

Abstract:

Newer office buildings are tightly sealed, keeping heat and pollutants in, creating a "chemical soup". Solvents, formaldehyde, cigarette smoking, and bacteria and fungi from humidifying and air conditioning systems

are just some of the indoor air pollutants. About five per cent of the population is "very sensitive" to indoor air pollutants and a further twenty per cent are "quite sensitive". Adequate ventilation standards are the proposed answer.

Witek, Theodore J.; Schachter, E. Neil; Colice, Gene; Beck, Gerald J.; Leaderer, Brian P.; Cain, William S. (1984). "Characterization of Irritative Effects from Low-Dose SO2 Exposure". Indoor Air, Vol. 3, pp. 211-215; Swedish Council for Building Research, Stockholm Sweden, 1984.

Keywords: sulphur dioxide; health effects; indoor air pollution

Abstract:

Sulphur dioxide (SO2) is a known irritant that is commonly found in indoor air. The authors measured subjective respiratory complaints in asthmatics and healthy subjects during exposure to low-levels of SO2 in an environmental chamber. Asthmatics complained more of lower airway irritation such as wheezing and chest tightness while healthy persons noted more upper airway irritation such as taste and unusual odour. Exercise increased complaints in asthmatics, but not in healthy persons. In addition, it was demonstrated that there is a relationship between lung function changes and non-specific airway reactivity as assessed by methacholine challenge within the group of asthmatics, suggesting that in some asthmatics airway hyperresponsiveness contributes to the sensitivity to SO2.

Women's Occupational Health Resource Center (1984). "Popular Duplicating Machines Can Cause Adverse Effects". Women's Occupational Health Resource Center, p. 2; June/July 1984.

Keywords: methyl alcohol; spirit duplicating machines; health hazards; indoor air pollution; schools; methanol

Abstract:

Small offices and schools are exposing employees, especially teacher's aides, to health hazards associated with overexposure to methyl alcohol in confined spaces. Symptoms include headaches, dizziness, nausea, blurring of vision, behavioural disturbances.

World Health Organization (1979). "Health Aspects Related to Indoor Air Quality". Working Group on Health Aspects Related to Indoor Air Quality, Bilthoven Netherlands, April 3-6 1979. EURO Reports and Studies #21. Inquire World Health Organization, Regional Office for Europe, Copenhagen, Denmark.

Keywords: United Nations; ventilation; hygiene; indoor air quality;

Abstract:

The health aspects of indoor air quality were reviewed by a Working Group convened by WHO in collaboration with the Government of the Netherlands. It was recognized that indoor air quality depended on a number of factors operating simultaneously; these were examined separately and in relation to each other. Pollutants generated outdoors, such as sulphur oxides, nitrogen oxides and carbon monoxide particulates, photochemical oxidants and biologically active particulates, and their relationship to the indoor environment were discussed. A number of pollutants released from indoor sources were identified, such as formaldehyde from particleboard and foamed insulation, radon from the soil or building materials, and fibres of asbestos. Indoor generation of nitrogen oxides, carbon monoxide, carbon dioxide, water vapour and particulates, through human physiological processes or use of unvented gas burning appliances, was also considered.

World Health Organization (1982). "Legionnaires' Disease". Report on a WHO Working Group, Baden Austria, 19-21 October 1981. EURO Reports and Studies #72. World Health Organization, Regional Office for Europe, Scherfigsvej 8, DK-2100 Copenhagen Ø Denmark, 1982.

Keywords: United Nations; Legionnaires' Disease; infection; incubation; legionellosis; cooling towers; evaporative condensers; drinking water;

Abstract:

A meeting of the Working Group was convened by the WHO Regional Office for Europe in collaboration with the Austrian Government. Legionnaires' diease, a multisystem disease with pneumonia as the principal clinical feature, acquired its name following the mysterious outbreak among people attending an American legion convention in Philadelphia in July 1976. In January 1977, a previously unrecognized bacterium was shown to be the agent responsible for the Philadelphia outbreak. The bacterium was named Legionella pneumophila and is now known to be a member of a large family of Legionellaceae. Dramatic common-source outbreaks have occurred in hotels, hospitals, and other establishments in association with contaminated water systems.

World Health Organization (1983). "Indoor Air Pollutants: Exposure and Health Effects". Working Group on Assessment and Monitoring of Exposure to Indoor Air Pollutants, World Health Organization, Regional Office for Europe, Scherfigsvej 8, DK-2100 Copenhagen Ø Denmark, 1983. EURO Reports and Studies #78.

Keywords: United Nations; ventilation; health effects; measurement;

Abstract:

The assessment and monitoring aspects of exposure to indoor air pollutants were reviewed by a Working Group convened by the WHO Regional Office for Europe in collaboration with the Government of the Federal Republic of Germany. The purpose of the meeting was to review prior work and work underway, and to evaluate the extent to which such work is likely to provide early estimates of actual population exposures and the extent of the health impacts associated with them. Nine main aspects discussed were: population exposure, adverse health effects, concentration values, existing standards, international steering committee on indoor air quality, exposure assessment and priorities, sick building syndrome, sulphur dioxide concentrations and indoor/outdoor relationships, and health effects assessment methodologies and priorities.

World Health Organization (1984a). "The Effects of the Indoor Housing Climate on the Health of the Elderly". Report on a Working Group, Graz, Austria, 20-24 September 1982. World Health Organization, Regional Office for Europe, Scherfigsvej 8, DK-2100 Copenhagen Ø Denmark, 1984.

Keywords: United Nations; elderly; housing; indoor climate; thermal factors; microorganisms; susceptibility; humidity;

Abstract:

A meeting of the Working Group on Indoor Housing Climate Impact on the Health of the Elderly was convened by the WHO Regional Office for Europe in collaboration with the Austrian Government. There has been increasing concern about the effects of the indoor climate of housing on people's health, especially those who may be considered to be at high risk, such as the elderly, the handicapped, and young children. These high-risk groups tend to spend more time at home than do other groups of people and apparently tend, for one reason or another, to be more sensitive or more reactive to extremes in indoor climatic conditions. There is concern not only among health specialists about the possible relationship between reduced ambient air temperatures and rates of ventilation in housing and respiratory diseases. U.S. research cited in the report indicated that indoor airborne viruses and bacteria were the most important causes of disabling illness in that country.

World Health Organization (1984b). "Summary Report: Working Group on Indoor Air Quality Research". Report on the Working Group on Indoor Air Quality Research, Stockholm, Sweden, 27-31 August 1984. World Health Organization, Regional Office for Europe, Scherfigsvej 8, DK-2100 Copenhagen Ø Denmark, 23 October 1984.

Keywords: United Nations; indoor air quality; sick building syndrome; analytical techniques; hypersensitivity;

Abstract:

A meeting of the Working Group on Indoor Air Quality Research was convened by the WHO Regional Office for Europe immediately following the Third International Conference on Indoor Air Quality and Climate in Stockholm, Sweden in August, 1984. The Group noted an increased interest in, but little corresponding progress in the determination or estimation of, the overall impact on public health of different pollutants identified in the indoor environment. The Group concluded that changes in building design and engineering practices can have serious consequences for air quality, and that when such changes are introduced, followup studies on the occupants perceptions, reactions, comfort and health should be carried out. Among other things, the Group also cited indications that the proportion of allergic or hypersensitive individuals in the population is increasing. They recommended that research be initiated into the possible contribution of poor indoor air quality to the causation of allergy and hyperreactivity, and to the frequency and severity of the responses. Special environmental requirements for the protection of the affected groups should be assessed.

Wotton, Ernest (1981). "Lighting For Education". Ontario Ministry of Education; 1981.

Keywords: lighting; illumination; energy management; fluorescent lighting; hyperactivity

Abstract:

This booklet considers some of the qualities and quantities that must be dealt with to produce good lighting for education. Such things as distracting hum from fluorescent light ballasts is dealt with. Fluorescent lighting's possible effect on hyperactive children is discounted due to lack of conclusive data. It is suggested that students working under fluorescent lighting with very good colour rendering become less visually fatigued than those working under some other forms of fluorescent lighting.

Wright, Michael; Kilian, D. Jack (1979). "Panel Discussion: Role of the Knowledge of High Risk Groups in Occupational Health Policies and Practices". Environmental Health Perspectives, Vol. 29, pp. 143-153; 1979.

Keywords: occupational health; chemicals; susceptibility; health hazards

Abstract:

When setting out occupational health policies and practices, industry, while being aware of the risks to susceptible workers, must also recognize that there may be dangers to the health of so-called non-susceptible workers as well. Reducing environmental exposure may be the most appropriate solution to the risk problem and cigarette smoking is also a hypersusceptibility factor that must be considered.

Yocom, J.E. (1983). "Industrial Sources of Metals". NeuroToxicology, Vol. 4, No. 3, pp. 91-102; 1983.

Keywords: oxides; metals; industrial processes; air pollution; burning

Abstract:

Any industrial process utilizing or producing inorganic materials releases metals (usually in the form of oxides or salts) into the environment. Metals and compounds containing metals may also be released from industrial processes based on organic materials where metals are used in the process. Significant quantities of metals are released from incinerators burning industrial and municipal waste. Metals are also released from combustion sources such as fuel burning for heat and power (including cars). Selected data is presented from the published literature on atmospheric emission of metals from several heavy industry categories and from incinerators.

Yoshida, Ken (1984). "Review of Research Projects".

Keywords: pesticides; aerosol science; air pollution; industrial hygiene

Abstract:

This is a review of Dr. Yoshida's research projects undertaken on pesticides in environment, aerosol science, air pollution and industrial hygiene at the Saskatchewan Research Council and University of Saskatchewan, College of Medicine, since 1967. Projects include Board of Education sponsored studies of air pollution and health at elementary schools.

Young, R.A.; Berk, J.V.; Hollowell, C.D.; Pepper, J.H.; Turiel, I. (1981). "Indoor Air Quality and Energy-Efficiency Ventilation Rates at a New York Elementary School". US Govt.; May 1981.

Keywords: air quality; school buildings; air flow; carbon dioxide; carbon monoxide; energy conservation; flow rate; formaldehyde; indoor air pollution; monitoring; New York City; nitrogen oxides; odour; ozone; radon; sulphur dioxide; ventilation

Abstract:

Indoor air quality at Oakland Gardens Elementary School in New York City was assessed under three different ventilation rates. A mobile laboratory was used to monitor air quality in two classrooms, a hallway, and outdoors. The parameters measured were air exchange rates, particulates, odour perception, carbon dioxide, carbon monoxide, sulphur dioxide, ozone, nitrogen oxides, radon, formaldehyde and total aldehydes. When the ventilation rate was reduced, carbon dioxide concentrations increased significantly, but did not exceed current occupational standards. At the low ventilation rate, odour acceptability decreased and in one of the classrooms the odours were judged unacceptable according to current ASHRAE standards. Calculations indicate that moderate energy savings can be achieved by reducing the ventilation rate in the classrooms.

Yulsman, Tom (1985). "The New Threat From PCBs". Science Digest, pp. 66-68, 84; February 1985.

Keywords: PCBs; leak; storage; PCDDs; PCDFs; dioxin; TCDF; air pollution

Abstract:

In 1981 an electrical fire in the basement of an 18 story New York state office building created an indoor environmental disaster. Oil containing PCBs spilled into the blaze and was changed by the heat into a dangerous brew containing, among other substances, dioxin. Contaminated soot was dispersed throughout the building by the ventilation system. Such fires have become fairly common, exposing large numbers of people to the risk of reproductory system damage, immune system damage, and cancer.

Zamm, Alfred V.; Gannon, Robert (1980). "Why Your House May Endanger Your Health". Simon & Schuster, New York NY, 1980.

Keywords: housing; health; environmentally induced diseases; dwellings; hazards

Abstract:

There are many environmental problems within buildings: chemical pollution, poisonous vapours, electrical particles, electromagnetic waves, dust, fumes from waxes and disinfectants. Hyperactivity, respiratory and digestive upsets, skin rashes, even symptoms of mental retardation can result from the presence of noxious chemicals indoors.

Zenik, H.; Hastings, L.; Goldsmith, M.; Niewenhuis, R.J. (1982). "Chronic Cadmium Exposure: Relation to Male Reproductive Toxicity and Subsequent Fetal Outcome". Journal of Toxicology and Environmental Health, Vol. 9, No. 3, pp. 377-387; Hemisphere Publishing Corp., 1982.

Keywords: cadmium; health effects; pollution

Abstract:

Acute injections of high doses of Cd induce marked testicular necrosis. However, the effects of low-dose, oral Cd exposure on a chronic basis are not well documented. The present investigation was designed to examine the effects of such exposure as reflected in parameters of spermatotoxicity and histology. The impact on fetal outcome was also measured. No significant effects were observed on any of the parameters of reproductive toxicity or fetal outcome. These findings suggest that, at the doses employed in this study, Cd did not have significant deleterious effects on the male reproductive system. Moreover, the traditional view of Cd-related testicular insult, based on acute exposure, injection protocols, needs to be re-evaluated in terms of environmental relevance.

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APPENDIX D

THE EFFECTS OF POLLUTED ENVIRONMENTS ON EDUCATION
A Review for the City of Toronto Board of Education

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APPENDICES (available from Board Offices upon request)

Sequence of Events Relating to the Junction Triangle

Letter to the Director of Education from the Director of the Public Health Branch, Ministry of Health, July 4, 1984

Letter to the Director of Education from the Minister of Environment, August 29, 1984

Report dated September 7, 1984 of the Business Administration Committee Agenda regarding the formation of a Pollution and Education Review Group and the undertaking of a review of the effects of polluted environments on education, (BAC Meeting, September 17, 1984).

Resolution of the Board of Education regarding the formation of a Pollution and Education Review Group and the undertaking of a review of the effects of polluted environments on education, (Minutes of Board Meeting of September 20, 1984)

Letter to the Chair and Members of the Board by Trustee Disero Regarding Use of Mobile PCB Destruction Facilities in the City of Toronto, (Board Agenda, September 20, 1984)

1. Background

The Business Administration Committee, in its meeting of September 17, 1984, reviewed the situation in the Junction Triangle and noted that despite recent studies, it was clear that a problem remained. The committee noted further that there is considerable scientific and practical evidence available which shows that polluted school and home environments do have a significant effect on both the health and educational performance of at least a portion of the school population, considering both students and staff. It concluded that it would be necessary to consolidate this information from a wider viewpoint before sufficient pressure could be brought to bear to resolve the Junction Triangle and other pollution/education issues.

On September 20, 1984, the Board therefore resolved that a comprehensive review of the effects of polluted environments on education in Toronto be conducted, with special emphasis on the Junction Triangle, the southerly portion of Ward 8, and other high pollutant areas. The study will be directed by a special Pollution and Education Review Group.

The following sections outline proposed terms of reference for the comprehensive review of pollution and education issues.

2. Overall Strategy

What is in short supply at the moment is neither the measurement of pollutant levels nor the cataloguing of health effects, but rather a knowledge base with which this data can be analyzed. What has become sufficiently clear is that some health risks are involved in pollutant exposure, and that there may be effects on the process of education as well.

The Toronto Board of Education recognizes that there are serious questions that must be answered, including:

- the Board's responsibilities insofar as providing a healthy educational environment are concerned;
- the question of liability in the event the air quality in an educational environment is shown to be detrimental;
- the question of moral or community responsibilities of Board Trustees to speak out on local issues affecting education in Toronto;
- the ongoing role of the Board as an educational authority in such issues as the effects of pollution on education; and the transfer of practical information to administrators, teachers, students and parents.

It was therefore decided by the Board that issues such as the level of outdoor pollution in the Junction Triangle area would be best served by gaining a better understanding in the short term of **the more general issue** of the effects of pollution on education. There is no question that further specific actions will be required with respect to specific issues such as the Junction Triangle, the southerly portion of Ward 8, and other high pollutant areas. Effective action will require co-operation with other government agencies at the Municipal, Provincial, and possibly even Federal levels. But differences of opinion over the significance of these specific issues will continue until more facts are brought to bear on the problems. This is the ultimate purpose of this review.

For example, Provincial guidelines on pollutant levels both outdoor and indoor do not specifically address the question of suitability of educational environments. In fact, indoor environment levels are based predominantly on industrial experience which has little bearing on the situation in a home or a classroom. Recent scientific and medical research has documented effects on health and learning skills of pollutant levels which are well below the pollutant levels which are now being used as guidelines.

One of the missing links in a full understanding of the significance of air pollutants can be found in recent research which explores **the range of vulnerability** within the general population. It appears that within any population there are great differences between individuals in their degree of tolerance to pollutants. There are also wide variations in the adverse acute or chronic effects that are exhibited by those who are affected demonstrably by pollutant exposures.

Educational situations differ from industrial or even residential situations in that the educational authority must accommodate the widest range of vulnerability that is found in the population. The recent Provincial Bill 82 requires that where possible Boards shall provide special education environments for exceptional children. It is becoming clear from recent research into the causes of learning disabilities, that pollution in the home and the classroom is one component that must be dealt with by educators, and that clean unpolluted school environments may be an important requirement for some if not all children (and staff!).

The review must therefore maintain the widest possible viewpoint on the link between pollution and education, with a view to applying new knowledge in this field to the solution of problems which are of specific concern to the Toronto Board. The review represents in fact the assembly of a mosaic, of which most pieces already exist. Until now, however, these pieces have not been brought to bear on education issues. The goal is to construct the mosaic, determine its significance, and identify which pieces are missing.

3. Summary of Tasks

On September 17th, 1984, the Business Administration Committee recommended that the review should include the following tasks:

1. Gathering Information:

   Finding and summarizing present scientific and practical knowledge concerning the effects of polluted school environments, both indoor and outdoor, on health, well-being, and educational performance of students and staff.

2. Consulting Interested Persons:

   Consulting with local individuals, groups and agencies having knowledge of and/or interest in such issues.

3. Determining Significance:

   Making conclusions about the general significance of this knowledge for the operation of schools by the Toronto Board of Education.

4. Relating to Specific Toronto Issues:

   Discussing specific Toronto issues, e.g. the Junction Triangle area, the southerly portion of Ward 8 and other high pollutant areas, painting, pest management and general chemical use in the schools, etc., in light of this accumulated knowledge.

5. Specifying Gaps in the Knowledge Base:

   Outlining the general method or nature of studies required (by the Board or others) to fill critical gaps in knowledge in this area.

6. Proposing Policies and Actions:

   Proposing specific policies, programs, and other actions that could be taken by the Board (or others) to address problems discovered.

4. Detailed Purposes of the Review

The review is designed to help organize the **problems**, as much as it is intended to help provide **solutions**. Detailed followup studies may be required by the Board or other agencies regarding specific issues. However, within the limitations of time and budget proposed, the review will be conducted in such a way as to contribute as much as possible to the following purposes:

1. To assist the Board in determining generally the extent to which students and staff are likely to be affected by polluted school environments in Toronto, and in deciding the significance of possible adverse effects;

2. To assist the Board in determining the degree of risk involved in specific situations, e.g. outdoor pollutant exposures in high pollutant areas, specific indoor pollutant exposures, etc.

3. To put down on paper in an organized form the facts and issues regarding pollution and education, as a focus for discussions between the Board and other interested parties, and for discussion within the community at large;

4. To assist the Board in specific negotiations with other agencies regarding actions necessary to create healthier school environments in Toronto;

5. To help the Board assess the degree of community concern regarding pollution and education;

6. To assist the Board in assessing questions of responsibility and liability with respect to the effects of pollution on education and health of the school population;

7. To provide practical information about pollution and education, and about how to provide healthy school environments, in a form which will be useful to administrators, teachers, students and parents in Toronto;

8. To assist the Board in determining policies regarding materials and procedures for school location, construction, renovation, and maintenance, where these affect school air quality;

9. To assist the Board in determining its ongoing role with respect to pollution and education issues;

5. Detailed Study Tasks

The study is divided into six major tasks, parts of which will run concurrently. Each task is discussed in turn below.

5.1 Gathering Information

Find and summarize present scientific and practical knowledge concerning the effects of polluted school environments, both indoor and outdoor, on health, well-being, and educational performance of students and staff.

A full literature search shall be undertaken by the consultant, covering the relation between pollution exposure and education, with regard to both health effects and their indirect influence on educational performance, and with regard to any possible direct effects of pollutant exposures on education capability and performance.

The consultant shall also contact other researchers in this field, in a variety of specialty disciplines, in order to gather any as yet unpublished information about work in progress that may be relevant to the purposes of this review.

In this phase of the work, the consultant shall not restrict the information gathering to those aspects wherein there is total agreement or proof within the scientific community. Rather any and all information that may appear relevant shall be accumulated. In the final report the consultant shall make every attempt to distinguish between issues on which there is good scientific supporting evidence, and issues where 'early warnings' have been uncovered, but for which full scientific backup is still lacking at this point.

The results of the literature search and other information gathering shall be summarized in the final report. A complete bibliography of references consulted and names and addresses of research contacts (where permission is given to do so) shall be included as an appendix to the final report.

5.2 Consulting Interested Persons

Consult with local individuals, groups and agencies having knowledge of and/or interest in such issues.

The consultant shall gather a list of local individuals, groups and agencies who may have knowledge of or interest in specific pollution/education issues in Toronto. Appropriate means of finding and gathering input from such persons shall be proposed by the consultant to the Pollution and Education

Review Group (e.g. some combination of individual discussions, small group meetings, public meetings, questionnaires, solicitations for briefs on personal experience, etc.).

It is expected that various members of the Pollution and Education Review Group will wish to participate in some of the meetings involving local (Toronto) individuals and issues. The consultant shall keep in close touch with the review group and undertake to keep members informed of community contacts and upcoming meetings.

As with the literature search and gathering of scientific information, the consultant shall not restrict the nature of information from the community on these issues, but rather shall invite and receive any and all information that such persons may consider relevant to their positions on pollution and education concerns. The results of discussions and other input from the educational community and the public shall be summarized in the final report, and copies of all letters and briefs shall be organized in a background report or Appendix to the main report.

5.3 Determining Significance

Draw conclusions about the general significance of this knowledge for the operation of schools by the Toronto Board of Education.

The consultant shall distill from the literature review, research contacts, community input and other information, those issues that appear to be of significance to the responsibilities of the Toronto Board of Education.

The consultant shall assess the validity and reliabilty of the information gathered, and clearly identify those issues for which sufficient information is available to come to firm conclusions. In these areas specific recommendations shall be made by the consultant to the Pollution and Education Review Group, which in turn will discuss, modify, and/or approve such recommendations before inclusion in the final report to the Board.

5.4 Relating to Specific Toronto Issues

Discuss specific Toronto issues, e.g. the Junction Triangle area, the southerly portion of Ward 8 and other high pollutant areas, painting, pest management and general chemical use in the schools, etc., in light of this accumulated knowledge.

All information available relevant to specific Toronto pollution/ education issues, e.g. studies pertaining to the Junction Triangle area, information on mobile PCB treatment units, etc. shall be included in this task. The consultant shall analyze the information gathered with respect to specific Toronto issues, in light of the information gathered on other more general aspects of the relation between pollution and education.

Where possible, the consultant shall make specific conclusions as to the significance of information available on the Toronto issues, and shall where necessary point out areas of disagreement between these conclusions and those of others involved in analysis of the same data and issues.

5.5 Specifying Gaps in the Knowledge Base

Outline the general method or nature of studies required (by the Board or others) to fill critical gaps in knowledge in this area.

It is expected that many gaps will be found in the knowledge about pollution and its effects on education, and that much additional information about specific Toronto issues may still be required before final conclusions can be drawn.

The consultant shall attempt to identify major and/or critical gaps in knowledge relevant to pollution and education issues, and in particular, the kind of additional information that is required to resolve the specific Toronto issues addressed.

Where possible, the means by which such information should ideally gathered shall also be discussed by the consultant in the final report, along with the reasoning for any recommendations and a discussion of any differences between the recommended methods and those employed by others who may also be involved in these issues.

5.6 Proposing Policies and Actions

Propose specific policies, programs, and other actions that could be taken by the Board (or others) to address problems discovered.

In consultation with the Pollution and Education Review Group, the consultant shall make specific proposals of policies, programs, and other actions that appear to be necessary in order to address pollution and education problems in Toronto. Such recommendations shall include actions which may be carried out by the Toronto Board of Education and actions which may be carried out by others (e.g. other levels of Government, teaching and administrative staff, parents, etc.).

All recommendations, along with the draft final report, shall be reviewed by the Pollution and Education Review Group prior to its presentation to the Board. The consultant shall co-operate by making amendments as considered necessary by the review group. If any areas of disagreement arise, the review group's decisions shall be binding, but the consultant will be allowed to describe any such areas from his/her point of view in a letter of qualification to the Board, which shall be separate from the final report, but which shall be included in the agenda of the Board meeting and will therefore be part of the public record along with the final report.

6. Study Schedule

The following schedule is proposed for carrying out the review of the effects of pollution on education. The due date of March 31, 1985 for the final report shall be fixed, but interim dates can be modified as necessary by the Pollution and Education Review Group in order to carry out the study in as efficient a manner as possible.

September 20, 1984	Board approves establishment of Pollution and Education Review Group and asks for terms of reference of comprehensive review.
October 16, 1984	Pollution and Education Review Group is formed and meets to agree terms of reference and budget for the review.
October 18, 1984	Board approval of terms of reference and budget.
late October, 1984	Contracting of preferred consultant.
October 31, 1984	Review begins. Pollution and Education Review Group, staff and consultant meet and agree methods of community consultation.
Nov. 1984 - Feb. 1985	Review group, staff and consultant hold various consultative meetings and undertake background review.
March 1985	Review and consultation completed; staff/ consultant submit first draft final report to review group; group meets to reach agreement on final wording, conclusions and recommendations to the Board.
End of March, 1985	Final report submitted to the Board.

APPENDIX 1 TO THE TERMS OF REFERENCE

1. Sequence of Events Relating to the Junction Triangle

On June 7, 1984, the Board passed a resolution urging the Minister of Health to undertake further action with respect to the effects of outdoor air pollutants on children in the Junction Triangle area.

A recent study undertaken by Dr. Walter Spitzer for the City of Toronto Department of Public Health indicated that there is a statistically higher incidence of certain physical symptoms among children in the Junction Triangle area than among those in other reference areas used as controls in the study.

The Ministry of Health has stated in a letter of July 4, 1984 to the Board that the study was inconclusive insofar as determining the relationship between industrial emissions and the health complaints observed. The Ministry therefore concluded that there was insufficient basis at this time to encourge relocation of industries.

Similarly, the Minister of Environment, in a letter dated August 29, 1984 to the Director of Education, echoed these same conclusions, and stated further that:

> "The health status study did not identify any serious health problems in the Junction Triangle population."

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Much of the focus in government circles has been on the question:

"How much pollution can they stand?"

We feel that just another long presentation about exposure levels will only serve to perpetuate a debate that is irrelevant. The Board of Education is not responsible for determining how much pollution people can stand and still pass their courses. The Board is responsible for helping children and adults in Toronto get an education. If lead and other pollutants are getting in the way of that education, then people must not be allowed to release them into our environment.

The point of most concern to the Board of Education should be whether current actions both within its own jurisdiction and by various other levels of government will eradicate Toronto's pollution problems as quickly as is humanly possible. **The authors and the Pollution and Education Group have concluded that not enough is being done. We feel that way because our society cannot afford to risk long-term impairment of our children.**

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